TM 9-1970-2

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

C4 annuls par C5
C5 annuls par C6

AMMUNITION
ANTIAIRCRAFT GUIDED MISSILE M1 (NIKE-AJAX) IDENTIFICATION, DESCRIPTION, PACKING, CARE, HANDLING, PRESERVATION, AND DESTRUCTION

C1, C3, C5

HEADQUARTERS, DEPARTMENT OF THE ARMY
FEBRUARY 1958

AGO 4059A—Feb

TECHNICAL MANUAL

AMMUNITION: ANTIAIRCRAFT GUIDED MISSILE M1 (NIKE-AJAX), IDENTIFICATION, DESCRIPTION, PACKING, CARE, HANDLING, PRESERVATION, AND DESTRUCTION

TM 9-1970-2
CHANGES No. 6

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON, 25, D.C., *25 May 1962*

TM 9-1970-2, 21 February 1958, is changed as follows:

Page 4, change 1, 21 March 1958 (as changed by C 3, 7 Apr 59): Paragraph 69, change the last sentence to read: Figure 41.1 gives the time limits for handling and storage of the M5 jato at various temperatures.

Page 5, change 1, 21 March 1958 (as changed by C 3, 7 Apr 59): Figure 41.1, change the title at the top and bottom of the illustration to read; Time versus temperature (handling and storage) for M5 or M5E1 jato.

Page 8, paragraph 7f: (As changed by C 4, 9 Jun 60) Change "Mil-Std-172" to read: Mil-Std-172A.

Page 16, paragraph 18: (As changed by C 4, 9 Jun 60) Change "20 (±2) ohms" to read: 22±6 ohms.

Page 57, paragraph 81a: (As changed by C 4, 9 Jun 60) Delete "(battery powered only for handling propellant mixture)."

Page 61, paragraph 87c: (As changed by C 4, 9 Jun 60) Change "the 2-inch stripe of paint will be blue" to read: the 2-inch stripe of paint will be brown * * * .

*These changes supersede C 5, 11 August 1961.

TAGO 6845A—May 610475°—62

Table X (Superseded). *Markings, Labels, and Placards Required for Shipment of Missile Components by Rail or Motor*

Components	Required markings (ICC nomenclature)	Shipment by motor or rail (ICC requirements)	
		Label	Placard
ANTENNA: GS18114	None	None	None
BATTERY, STORAGE: BB–401/U	None	None	None
BODY, GUIDED MISSILE: M2 or XM2	None	None	None
DELAY LINES	None	None	None
EXPLOSIVE HARNESS ASSEMBLY, GUIDED MISSILE: M24 and M45.	"BOOSTERS EXPLOSIVE"—HANDLE CAREFULLY.	None	EXPLOSIVE
FIN, GUIDED MISSILE: M9, M10, and M12.	None	None	None
IGNITER, ROCKET MOTOR: M24 or M65.	Igniter, Jet Thrust, Class A Explosives	None	Explosives
NITRIC ACID, GUIDED MISSILE: IRFNA.	Corrosive Liquid	White [1] [2]	Dangerous [3] [4]
PROPELLANT MIXTURE, GUIDED MISSILE: M3.	Flammable Liquid	Red [1] [5]	Dangerous [3] [4]
ROCKET MOTOR, GUIDED MISSILE: M5 w/ or w/o separately packaged igniter in the shipping crate.	Jet Thrust Units, Class B Explosive	None	Dangerous [4]
SAFETY AND ARMING DEVICE, GUIDED MISSILE: M30A1.	Percussion Fuse	None	None
STARTING MIXTURE, GUIDED MISSILE: UDMH.	Flammable Liquid	Red [1] [5]	Dangerous [3] [4]
THRUST STRUCTURE, GUIDED MISSILE: M2.	None	None	None
WARHEAD, GUIDED MISSILE: M2, M3 or M4.	Explosive Projectile	None	Explosive

[1] Where railway express, less-than-carload, or less-than-truckload shipments are made, these labels must have the shipper's name placed in the space provided.

[2] Illustrated in paragraph 73.407(a)(2) of the ICC Regulations.

[3] Truckloads, or truck shipments, of less than 2,500 pounds gross weight do not require placards. See section 77.823(a) of the ICC Regulations.

[4] Motor vehicles carrying 5,000 pounds gross weight or more of this article or articles identified by [4] will be placarded in accordance with paragraph 77.823 of the ICC Regulations. The placards will be reflectorized and have block 8-inch letters in accordance with AR 55–355.

[5] Illustrated in paragraph 73.405(a) of the ICC Regulations.

Table XI. (Superseded) *Loading Compatibility for Missile Components for Rail and Motor Shipment*

(The letter X indicates that these items must NOT be loaded or stowed together.)

Component	Antenna: GS 18114	Battery, storage: BB-401/U	Body, guided missile: M2 and XM2	Delay lines	Explosive harness assembly, guided missile: M24 and M45	Fin, guided missile: M9, M10, and M12	Igniter, jato, electric, M24 [1] and M65 [1]	Jato unit, guided missile: M5 w/ or w/o igniter	Nitric acid, guided missile: IRFNA	Propellant mixture, guided missile: M3	Safety and arming device, guided missile: M27, M30, and M30A1	Starting mixture, guided missile: UDMH	Thrust structure, jato, guided missile: M2	Warhead, guided missile: M2, M3 and M4
ANTENNA: GS 18114.														
BATTERY, STORAGE: BB-401/U.														
BODY, GUIDED MISSILE: M2 and XM2.														
DELAY LINES.														
EXPLOSIVE HARNESS ASSEMBLY, GUIDED MISSILE: M24 and M45.	---	---	---	---	---	---	---	---	X	X	---	X		
FIN, GUIDED MISSILE: M9, M10, and M12.														
IGNITER, JATO, ELECTRIC: M24 [1] and M65 [1].	---	---	---	---	---	---	---	---	X	X	---	X		
JATO UNIT, GUIDED MISSILE: (w/ or w/o igniter).	---	---	---	---	---	---	---	---	X	X	---	X		
NITRIC ACID, GUIDED MISSILE: IRFNA.	---	---	---	---	X	---	---	X	---	X [2]	---	X [2]	---	X
PROPELLANT MIXTURE, GUIDED MISSILE: M3.	---	---	---	---	X	---	X	X [2]	X [2]	---	---	---	---	X
SAFETY AND ARMING DEVICE, GUIDED MISSILE M27, M30, and M30A1.														
STARTING MIXTURE, GUIDED MISSILE: UDMH.	---	---	---	---	X [2]	---	X	X [2]	X [2]	---	---	---	---	
THRUST STRUCTURE, JATO, GUIDED MISSILE: M2.														
WARHEAD, GUIDED MISSILE: M2, M3, and M4.	---	---	---	---	---	---	---	---	X	X	---	X		

[1] Igniters shipped in same container with jato M5 are considered the same as the jato for compatibility.

[2] For safety reasons it is recommended that these items not be loaded, or shipped in the same vehicle; such loading is NOT restricted by ICC regulations.

Note. Loading of additional compatible items within the same transporting vehicle is permitted provided the loading and bracing is in compliance with an approved Ordnance Corps drawing. The securement method(s) prescribed by approved Ordnance Corps drawings is mandatory. If basic drawing calls for one container high, six containers per truck; then additional items, if compatible, may be loaded on the vehicle, but not on top of the containers, and the method of securement must be similar.

Page 68. Paragraph 100.1 (As added by C 4, 9 Jun 60).

100.1 Decontamination of Shipping Containers for Fuels

a. Containers which have been used to ship UDMH and UDMH jet fuel are not returnable and will be salvaged locally. Before being salvaged, these containers must be thoroughly decontaminated. Either of the following methods, depending upon local conditions, may be used for this decontamination. Decontamination by fire is the preferred method.

(1) *Steam.* Open and drain containers, then force steam or boiling water into the containers for a period of 3 to 5 minutes until all traces of fuel have been removed.

(2) *Fire.* Open and drain containers, then place on a pile of oil-soaked wood or other combustible material. Ignite the combustible material and allow the flames to envelop the container from 5 to 10 minutes until all traces of fuel have been removed.

b. After either of the above decontamination procedures, the containers must be certified, in accordance with AR 755–5, as being free from contamination. The responsible officer will sign a certificate indicating that the containers have been inspected and are free of hazardous material.

Note. Safety regulations listed in paragraphs 82, 83, and 106 will be observed when handling containers or caps and during the process of decontamination.

108. Disposal of Liquid Propellants

* * * * *

c. (As superseded by C 4, 9 Jun 60) *Disposal of Unserviceable Acid.* Instructions for disposing of IRFNA are contained in TB 9–1375–200–50/1.

By Order of the Secretary of the Army:

G. H. DECKER,
General, United States Army,
Chief of Staff.

Official:

J. C. LAMBERT,
Major General, United States Army,
The Adjutant General.

Distribution:
To be distributed in accordance with DA Form 12–32, Sec II (Unclas) requirements for Nike-Ajax, TM, Ammunition, EXCEPT NG: None.

TAGO 6845A

U.S. GOVERNMENT PRINTING OFFICE: 1962

TECHNICAL MANUAL

AMMUNITION: ANTIAIRCRAFT GUIDED MISSILE MI (NIKE-AJAX) IDENTIFICATION, DESCRIPTION, PACKING, CARE, HANDLING, PRESERVATION, AND DESTRUCTION

TM 9-1970-2
CHANGES No. 3

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D.C., *7 April 1959*

TM 9-1970-2, 21 February 1958, is changed as follows:

Page 4, change 1, 21 March 1958:

Paragraph 69, change the last sentence to read: Figure 41.1 gives the time limits for handling and storage of the M5 jato at various temperatures.

Page 5, change 1, 21 March 1958:

Figure 41.1, change the title at the top and bottom of the illustration to read: Time versu temperature (handling and storage) for M5 or M5E1 jato.

[AG 471.6 (2 Mar 59)]

By Order of *Wilber M. Brucker*, Secretary of the Army:

MAXWELL D. TAYLOR,
General, United States Army,
Chief of Staff.

Official:

R. V. LEE,
Major General, United States Army,
The Adjutant General.

Distribution:

Active Army:

DCSLOG (1)
CNGB (1)
ASA (1)
Tech Stf, DA (1) except CofOrd (12)
Ord Bd (2)
USCONARC (3)
USA Arty Bd (2)
USA Armor Bd (1)
USA Inf Bd (1)
USA Air Def Bd (1)
USA Abn & Elct Bd (1)
USA Avn Bd (1)
USA Arctic Test Bd (1)
US ARADCOM (1)
US ARADCOM Rgn (1)
OS Maj Comd (2) except USAREUR (5)
Log Comd (3)
MDW (1)
Armies (3) except First US Army (5)
Corps (2)
Div (2)
Ord Gp (2)
Ord Bn (2)
Ord Co (2)
Svc Colleges (2)
Br Svc Sch (2) except USA Ord Sch (50)
PMST Sr Div Ord Units (1)
Ord Ammo Comd (1)
GENDEP (1)
Ord Sec, GENDEP (1)
Ord Dep (1)
Ports of Emb (OS) (1)
Trans Terminal Comd (1)
Army Terminals (1)
OS Sup Agcy (1)
Ord PG (1)
Ord Arsenals (5)
Mil Dist (1)
USA Corps (Res) (1)
Sector Comd, USA Corps (Res)
Ord Proc Dist (1) except Sp field Ord Proc Dist (none)
Fld Comd, AFSWP (1)
Units organized under foll TOE's:
19-177 (2)
44-145 (2)
44-146 (2)
44-147 (2)
44-446 (2
44-447 (2
44-448 (2

NG: State AG (3); units—same as Active Army except allowance is one copy to each unit.

USAR: None.

For explanation of abbreviations used, see AR 320-50.

U. S. GOVERNMENT PRINTING OFFICE: 191

TAGO 5165A—Apr. 480474°—59

skin section attached by screws to an adapter ring and a magnesium-alloy casting. The skin sections * * * fuel shutoff valve. The separation switch that activates the roll stabilization system at booster separation projects through a hole in the top of this casting. A lanyard, attached to the forward perimeter of the jato thrust structure, activates the air pressure regulator valve assembly located in the aft end of the missile body section, pressurizing propellant tanks at booster separation. The aft body * * * section by 20 bolts.

h. Tunnels. Four tunnels, formed * * * to station 230.750. The tunnels are numbered clockwise as viewed from the aft end, with tunnel No. 1 being on top of the missile in flight attitude. They protect the * * * the missile body.

24. Delay Lines, GS 15666 Series and GS 17194 Series

* * * * *

b. GS 17194 Series (fig. 17). The lines in * * * the top surface. This series consists of eight individually numbered delay lines and is used in the GS 16725 guidance section only. Markings on the * * * individual line number.

25. Antennas, GS 19745 Series

These components of the missile guidance section project from the missile body at 90° angles about station 72. They are installed for the purpose of eliminating frequencies other than that frequency controlling the missile.

30. Guided Missile Starting Mixture Unsymmetrical Dimethylhydrazine (UDMH)

* * * * *

b. Physical and Chemical Properties. This starting fuel is a powerful reducing agent and is hypergolic (capable of igniting spontaneously upon contact) when mixed with red fuming nitric acid. UDMH is a clear * * * atmosphere) at 70° F. It boils at 146° F., freezes at —72° F., is soluble in all proportions with water and alcohol, and has a sharp ammoniacal or fishy odor. This chemical is * * * following chemical composition:

* * * * *

Page 26, paragraph 30*c*(1):

Underline that sentence which reads: It is not, consequently, self-warning in this respect.

Page 26, paragraph 30*c*(2):

Underline that sentence which reads: Therefore, UDMH is not self-warning in this respect.

31. Guided Missile Propellant Mixture M3

* * * * *

b. Physical and Chemical Properties. Guided missile propellant * * * pressure of JP–4. The fuel has a vapor pressure of 2.3 psi at 60° F. and has a closed cup flash point of —15° F. (Tag. closed cup). Due to the * * * is as follows:

JP–4	83+0.3 percent
UDMH	17+0.3 percent
Water	0.4 percent maximum

* * * * *

32. Guided Missile Nitric Acid (IRFNA)

* * * * *

b. Physical and Chemical Properties. IRFNA is a * * * in all proportions. The nitric acid described in this manual has a specific gravity of 1.563±0.007 at 20°/20° C. (68°/68° F.), a boiling point of 183° F., and a freezing point of —60° F. (—51° C.). Chemical composition of * * * in table II.

Table II. Chemical Composition of IRFNA

Component	Percent by weight
Nitric acid	81.3—84.5
Nitrogen dioxide	13.0—15.0
Water	2.0—3.0
Hydrofluoric acid*	0.5—0.7
Maximum total solids	0.1— - - -

*(Superseded) This agent provides a protective coating on the inside of the missile oxidizer tank and inhibits reaction between nitric acid and aluminum containers.

38. Jato Unit M5

* * * * *

b. Wooden Crate M13 (fig. 27). This container is * * * thrust structure assembled. The crate is painted with an all-purpose fire and weather resistant olive-drab paint and marked in black as shown in figure 27.

Warning (Added): **It is unsafe to lift crate M13, complete with booster, by the lifting eyes unless the crate is secured with four undamaged 1¼-inch steel straps. If the steel straps are missing, poorly secured, or weakened in any way, the crate with booster should be lifted by slings under the load.**

40. Guided Missile Body M2 and XM2

a. Missile Shipping Container M326 (fig. 33). This pressurized and * * * the hermetic seal. To protect the missile body from dampness, the con-

tainer is pressurized to 5 psi with dry air. Silica gel desiccants * * * found in SM 9–1–8140.

b. (Superseded) *Handling Ring Assembly for Container.* The missile body is shipped in this container with two complete handling ring assemblies. Each of the handling ring assemblies is made up of four segment assemblies: two of these segment assemblies are right hand and are marked with part number 8020231; two are left hand and are marked with part number 8020225. The other numbers identify the casting only, and are 8020229 (right hand) and 8020230 (left hand). Segment assemblies 8020231 are attached between tunnels 1 and 2, and 3 and 4. Segment assemblies 8020225 are attached between tunnels 1 and 4, and 2 and 3.

Page 36. Delete ORD part numbers 8020230 (two places) and 8020229 (two places) from figure 34, RA PD 435066.

47. Rocket Fuel Handler's Coveralls

(fig. 39)

These 1-piece coveralls * * * a comfortable ... **Before** use, a stream of water is sprayed over the coveralls and the resulting evaporation cools the wearer.

50. Rocket Fuel Handler's Gloves

(fig. 41)

These gloves are * * * fuels and oxidizers.

***Warning:* Care must be taken to prevent spillage from running up the gauntlet, forming a pocket, and trickling down on the inside.**

Table V. First Aid for Accidents Involving Missile Components

Hazards	Swallowing liquid	Inhalation of vapors	Eye, ear, or skin contact
* *	* *	* *	*
NITRIC ACID, GUIDED MISSILE: (IRFNA).	Give casualty liberal amounts of fresh water or bicarbonate of soda solution (two tablespoons to a pint of water). Do not force vomiting.[1] Immediate medical attention is necessary.	Remove casualty from contaminated atmosphere and summon immediate medical aid.[2]	Flush contaminated eyes for 15 minutes with water. Flush contaminated skin areas, **first with copious amounts of cool water, then with a 5-percent bicarbonate of soda solution for 15 minutes.** Immediate medical attention is necessary.[3]
* *	* *	* *	*

71. Guided Missile Body M2 and XM2

a. Storage Requirements and Limits. **The guided missile body is unclassified in the zone of interior. In all other localities it is classified CONFIDENTIAL for storage and shipping and must be handled in accordance with AR 380–55 and AR 55–225. See also paragraph 68.** Since the body * * * than two high.

* * * * *

82. Special Precautions

* * * * *

h. Approved safety tools **must be used.**

90. Loading and Unloading Rail Shipments

* * * * *

c. The following general * * * and unloading operations:

* * * * *

(3) Liquid propellants must be loaded as follows:

* * * * *

(*b*) Drums of IRFNA shall not be loaded more than **two tiers** high in railway cars. **They must be loaded, blocked, and braced in accordance with applicable Ordnance Corps drawings.**

* * * * *

95. Decontamination of IRFNA Drums Prior to Shipping

a. (Superseded) Each drum must be well-secured with its bung cap so that no water can enter and no IRFNA can leak from the drum; then the bung cap must be sealed with a standard lead car seal.

b. (Superseded) After the bung cap is tightly secured and sealed (*a* above), the drum exterior will be thoroughly flushed with water.

c. In less-than-carload * * * the ICC Regulations.

d. Rescinded.

100. Decontamination of Drums for Propellant Mixture M3

a. (Superseded) *Decontamination.* The drums used to ship propellant mixture M3 are not returnable and those not needed for local defueling operations will be salvaged after use. Before salavaging, the drums first must be decontaminated. After decontamination, they must be mutilated by crushing or cutting so that they cannot again be used as containers. Either of the following methods, depending on local conditions, may be used for decontamination.

(1) *Steam washing.* Remove bung caps and invert drum (bung down) on a locally fabricated rack to drain. Catch drained fluid in a suitable container and transfer to a usable drum for later disposal. Insert the steam pipe 8 inches into the drum (the outside diameter of the pipe should not be more than one-half the diameter of the bung opening). Force steam into the drum for at least 5 minutes. Remove the drum and test for the presence of propellant mixture. If odor of the propellant mixture M3 is detected, repeat the steaming operation until no odor can be detected. Bung caps should also be thoroughly steamed.

(2) *Burning.* Remove bung caps and invert drum (bung down) on rack to drain. Transfer drained fluid to a usable drum for later disposal. Move drums to area for burning. Prepare a pile of oil-soaked wood approximately a foot thick and covering an area large enough to accommodate drums. Place fuel drums, bungs up, on the pile of wood. Ignite the oil-soaked wood with a train of combustible material as prescribed in paragraph 123, TM 9–1903, observing precautions in paragraph 125*b*(1), TM 9–1903.

b. After either of * * * **paragraphs 82 and 83.**

c. (Added) *Disposal of Excess Propellant Mixture M3.* To dispose of propellant mixture M3 collected from drums to be salvaged, place in a shallow vessel and ignite with a train of combustible material as prescribed in paragraph 123, TM 9–1903, observing precautions in paragraph 125*b*(1), TM 9–1903.

[AG 471.6 (22 Oct 58)]

102. Report of Destruction

Before explosive components are destroyed, **an ammunition condition** report will be made through channels to the Chief of Ordnance. In the case * * * see paragraph 3*f*.

108. Disposal of Liquid Propellants

a. Disposal of UDMH. Small quantities (one * * * protection to personnel.

Warning (Added): **Personnel disposing of UDMH must not be permitted to work alone.**

b. Disposal of Guided Missile Propellant Mixture M3.

* * * * *

Warning: **Personnel not in full protective clothing must remain at least 1000 feet upwind from the disposal site.**

109. General

* * * * *

c. If destruction becomes necessary, missiles and components must be so thoroughly **destroyed** that use or restoration to serviceable condition **will be impossible.** It is important * * * priority in destruction.

* * * * *

By Order of *Wilber M. Brucker*, Secretary of the Army:

MAXWELL D. TAYLOR,
General, United States Army,
Chief of Staff.

Official:

R. V. LEE,
Major General, United States Army,
The Adjutant General.

Distribution:

Active Army:

DCSLOG (1)
Technical Stf, DA (1) except
  CofOrd (10)
Ord Bd (2)
USCONARC (3)
USA Arty Bd (3)
USA Armor Bd (3)
USA Inf Bd (3)
USA Air Def Bd (3)
USA Abn & Elct Bd (3)
USA Avn Bd (3)
USA Arctic Test Bd (3)
US ARADCOM (2)
US ARADCOM Rgn (2)
OS Maj Comd (5) except
  USARAL (2)
  USARCARIB (3)
  USARPAC (3)
Log Comd (3)
MDW (1)
Armies (3)
Corps (2)
USMA (3)
Svc Colleges (2)
Br Svc Sch (2) except
  USA Ord Sch (5)
  USAAMS (5)
  US ARADSCH (100)
USA Ord GM Sch (70)
Gen Depots (2)
Ord Sec, Gen Depots (10)
Ord Depots (10) except
  Letterkenny Ord Depot (15)
Phila QM Depot (3)
Ord Ammo Comd (1)
USA Ord Msl Comd (1)
USAREUR, ComZ (5)
Ports of Emb (OS) (2)
Trans Terminal Comd (2)
Army Terminals (2)
OS Sup Agcy (1)
Ord PG (10)
Ord Arsenals (10) except
  Raritan Arsenal (25)
Army Rocket GM Agcy (30)
Ord Proc Dist (2) except
  Springfield Ord Proc Dist (none)
Fld Comd, AFSWP (20)
MAAG (Italy) (1)
MAAG (Denmark) (1)
MAAG (Norway) (1)
MAAG (France) (1)
MAAG (Belgium) (1)
MAAG (West Germany) (1)
MAAG (Taiwan) (3)
MAAG (Netherlands) (1)
MAAG (United Kingdom) (3)
JUSMAG (Greece) (1)
JAMMAT (Turkey) (1)
Units organized under following TOE's:
  9–12 (1)
  9–17 (1)
  9–45 (1)
  9–46 (1)
  44–145 (2)
  44–146 (2)
  44–147 (2)
  44–446 (2)
  44–447 (2)
  44–448 (2)

NG: State AG (3); units—same as Active Army except allowance is one copy to each unit.
USAR: None.
For explanation of abbreviations used, see AR 320–50.

TAGO 2585A

U. S. GOVERNMENT PRINTING OFFICE: 1954

TECHNICAL MANUAL

AMMUNITION: ANTIAIRCRAFT GUIDED MISSILE M1 (NIKE-AJAX) IDENTIFICATION, DESCRIPTION, PACKING, CARE, HANDLING, PRESERVATION, AND DESTRUCTION

TM 9-1970-2
CHANGES No. 2

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., *13 November 1958*

TM 9-1970-2, 21 February 1958, is changed as follows:

2. Other Publications

Information concerning the missile guidance section, hydraulic system, and propulsion system can be found in **TM 9-5012-1.** Other related publications are listed in the appendix.

4. NIKE-AJAX System

(fig. 2)

The NIKE-AJAX system is designed **to detect, acquire, attack, and kill** high speed and high altitude enemy aircraft operating outside of the capabilities of conventional antiaircraft artillery. By means of * * * target tracking radar. Electronic computers convert the target position data into high frequency radio steering commands which are sent to the missile by a missile tracking radar, enabling the missile to **attack** and destroy the target. The NIKE-AJAX * * * launch ready missiles. Further information on the missile system can be found in **TM 9-5010-1.**

5. Antiaircraft Guided Missile

(fig. 1)

Antiaircraft guided missile * * * of the missile. The guidance section also receives, **decodes,** demodulates, and amplifies incoming signals. These amplified signals are used to activate hydraulically operated **ailerons** and fins which establish and maintain proper **attitude** and path control of the missile. The destructive power * * * the missile body. The signal for the detonation of these warheads is supplied by **the computer through the missile track radar to** the guidance section. For further information on the missile, see **TM 9-5012-1.**

6. Missile Components

(fig. 3)

* * * * *

b. Packaging and Marking. The components **listed in table I** are packed in pressurized, dehumidified metal containers; aluminum drums and bottles; and wooden ammunition boxes or crates. These various containers * * * in chapter 3.

Table I. Authorized Components

Approved nomenclature	Quantity per complete round	Former nomenclature
* *	*	* *
NITRIC ACID, GUIDED MISSILE	242 lb ±1 lb*	NITRIC ACID, fuming technical, type III.
PROPELLANT MIXTURE, GUIDED MISSILE: M3.	49 lb ±0 lb −0.5 lb*	FUEL, rocket engine, M3.
SAFETY AND ARMING DEVICE, GUIDED MISSILE: M27, M30, or M30A1**.	2	ARMING MECHANISM, safety, M27 (T93E8), T90E3, or M30A1.
SAFETY AND ARMING DEVICE, GUIDED MISSILE: M30 or M30A1 (Rescinded).	2	ARMING MECHANISM, safety, T90E3 or M30A1.
* *	*	* *

**(Added) Safety and arming devices, within a missile should be of one type only and from the same lot. Safety and arming device M27 is to be superseded by safety and arming devices M30 and M30A1. Safety and arming device M30 has a limited service life and must be used within two years from date of manufacture.

7. Identification

* * * * *

b. Station System of Reference. Specific locations on * * * expressed in "stations." A station location is a distance in inches on the missile measured aft from **an imaginary point in space forward of the nose where the nose lines would intersect if they continued to a point. The nose section starts at 0.312 rather than 0.000.** For example, the lift point of the missile is at station 140.90, i. e., at 140.90 inches aft of the **imaginary point or 140.59 inches** aft of the tip of the nose. It is important * * * to this system.

* * * * *

h. Logbooks. Each missile is * * * in this logbook. Portions of the logbook **become** CONFIDENTIAL **when missile data is added** and must be handled in accordance with AR 380–5. Whenever a missile * * * and shipping documents.

13. Guided Missile Safety and Arming Device M30A1

(fig. 6)

* * * * *

b. Description. The external appearance * * * in the following:

* * * * *

(2) The UNARMED position * * * through the window. **In some cases the white portion of the G-weight may not completely fill the window, and that unfilled portion of the window may give the illusion of blackness. Therefore, white, or white and black, indicate that the device is unarmed.**

Note. Two safety and arming devices of one type (either M30 or M30A1), and from the same lot, are used in each missile. They are connected * * * the missile body.

* * * * *

17. Guided Missile Warheads M3 and M4

(fig. 9)

* * * * *

a. Warhead M3. The forward mounting * * * length of 23 inches. It has a maximum diameter of 11⅞ inches and weighs **179** pounds.

b. Warhead M4. The mounting adapters of the M4 warhead attaches to the forward and aft mounting brackets by **anchor** lugs and bolts. The M4 warhead * * * length of 21½ inches. It has a maximum diameter of 11⅞ inches and weighs **122** pounds.

18. Electric Jato Igniter M24

(fig. 10)

The igniter is * * * a snap ring. The cup contains **2.2** pounds of explosive (a mixture of black powder **and trench mortar sheet propellant)** and four resistors and four M1A1 squibs connected in series-parallel. There is a * * * weighs 9 pounds.

19. Jato Unit M5

(fig. 12)

The jato unit * * * of the body. The propellant grain is initiated by an **electric jato** igniter **M24** installed in the head of the jato unit. Three fins located * * * the jato unit.

* * * * *

b. Body. The body is * * * and date loaded. Printed lengthwise along the chamber are the firing temperature limits (**—10° to +130° F.**) and the storage temperature limits (**—20° to +130° F.**). (See table VI).

* * * * *

g. (Added) *Service Life.* The reliable service life of jato units M5 and M5E1 is 10 years. Units that exceed this age should be reported through command channels for disposition (par. 107*e*).

21. Guided Missile Body M2 and XM2

(fig. 13)

* * * * *

c. Guidance Section (*Sta. 44.750–75.781*). The guidance section * * * cylindrical magnesium casting. This casting is sealed so that the contents (except the battery box) can be pressurized **during storage.** It contains a recessed box for the BB–401/U battery and the guidance units consisting of electronic components which receive, **decode,** demodulate, and amplify the missile commands received from ground-based command equipment. Four antennas project * * * elevator control section.

d. Center Body Section (*Sta. 75.781–108.656*). This section consists of **a top door and a bottom skin section** attached by screws to a forward and aft structural ring. The section houses * * * the two sections.

* * * * *

g. Aft Body Section (*Sta. 198.652–251.000*). This section consists of **a top door and a bottom**

TECHNICAL MANUAL

AMMUNITION: ANTIAIRCRAFT GUIDED MISSILE M1 (NIKE–AJAX) IDENTIFICATION, DESCRIPTION, PACKING, CARE, HANDLING, PRESERVATION, AND DESTRUCTION

TM 9–1970–2
CHANGES No. 1

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., *21 March 1958*

TM 9–1970–2, 21 February 1958, is changed as follows:

TAGO 4958A—Mar. 440473°—58

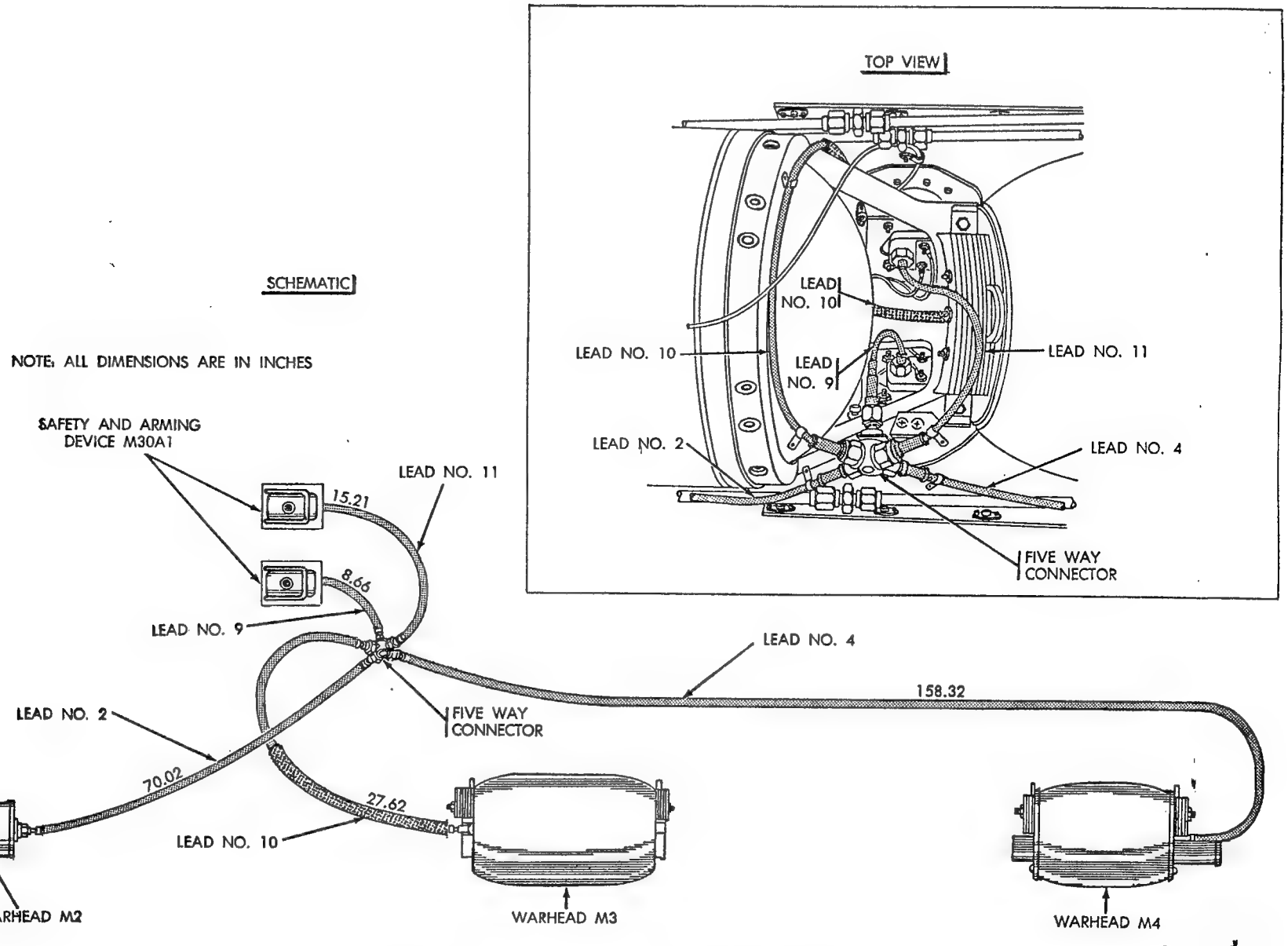

Figure 7. (Superseded) *Explosive harness assembly M45.*

Table VI. (Superseded) *Quantity-Distance Classes, Compatibility Groups, and Special Handling Instructions for Explosive Components and Liquid Propellants*

Component	Quantity-distance class	Compatibility group	Special handling instructions
EXPLOSIVE HARNESS ASSEMBLY, GUIDED MISSILE: M24 and M45.	10	B, I	Sensitive to heat, friction, and impact and may detonate when burned in large quantities. Do not drop, slide, or drag containers over floors or other containers.
IGNITER, JATO UNIT: M24	10	O	Sensitive to heat, impact, friction, and static charge. Never attempt to disassemble igniter. Collect loose explosive from leaking igniters and dispose of in accordance with local standing operating procedures and safety regulations. Keep shorting plug in place except when igniter is installed in jato or being tested.
JATO UNIT: M5	10	F	Handle with care since propellant grain is fragile and susceptible to damage by rough treatment. Always lift unit at two points with total bearing surface of at least 12 inches. See TM 9–1955 for further instructions.
NITRIC ACID, GUIDED MISSILE: (IRFNA).	150	PA	Proper protective clothing will be worn. Solution of sodium bicarbonate to neutralize skin contamination and sufficient supply of water for decontaminating spills and leaks must be available during handling. Drums should not be rolled. If drums must be rolled, check bungs for security, and roll drums slowly and carefully.
PROPELLANT MIXTURE, GUIDED MISSILE: M3.	150	PC	Rough handling must be avoided. Drums should not be rolled since this will damage the stacking lugs. Retain drums on pallet during handling if possible.
SAFETY AND ARMING DEVICE, GUIDED MISSILE: M27, M30, and M30A1.	3	B	Avoid all rough handling as devices contain delicate clockwork mechanisms.
STARTING MIXTURE, GUIDED MISSILE: UDMH.	150	PC	Containers must be handled carefully at all times. During disposal operations, handling equipment and containers must be electrically grounded. In all operations, personnel will wear appropriate protective clothing.
WARHEAD, GUIDED MISSILE: M2, M3, and M4.	10	G	Electric powered lift for handling is recommended. Keep handling and number of operating personnel to a minimum. Lift uncrated warheads with special warhead handling yoke.

66. Quantity-Distance and Storage Compatibility

* * * * *

b. (Superseded) *Liquid Propellants.* Information on the quantity-distance classes and special handling instructions for liquid propellants may be found in table VI. Instructions on quantity-distance for storage of fuels and oxidizers can be found in table IX. General information on compatibility grouping of liquid propellants can be found in TM 9–1903. Fuels and oxidizers must not be stored together.

69. Explosive Components

(Superseded)

For magazine storage drawing file numbers, see SM 9–5–1336. Table VI gives quantity-distance classes, compatibility groups, and special han-

dling instructions for explosive components and liquid propellants. Table VII lists the authorized combination (mixed) storage of explosive components. Table VIII lists the time a jato M5 can be exposed to various temperatures and not go below the minimum safe firing temperature. Figure 41.1 gives the time limits for storage (only) of the jato M5 at various temperatures.

Table VIII. (Superseded) *Jato M5 Safe Firing Temperatures*

Outside temperature	Safe temperature firing limit	Initial temperature of jato				
		75° F.	60° F.	45° F.	30° F.	15° F.
Minus 10° F	Plus 10° F	24.8 hr	20.8 hr	16.2 hr	9.8 hr	1.0 hr
	0° F	38.3 hr	34.4 hr	29.8 hr	23.3 hr	14.5 hr
	Minus 10° F					
Minus 20° F	Plus 10° F	19.4 hr	16.0 hr	12.2 hr	7.0 hr	0.9 hr
	0° F	27.3 hr	23.9 hr	20.1 hr	15.0 hr	8.6 hr
	Minus 10° F	40.9 hr	37.4 hr	33.7 hr	28.8 hr	22.1 hr
Minus 30° F	Plus 10° F	16.9 hr	13.0 hr	9.8 hr	5.2 hr	0.7 hr
	0° F	22.5 hr	18.6 hr	15.4 hr	11.1 hr	6.1 hr
	Minus 10° F	29.6 hr	26.6 hr	23.3 hr	19.1 hr	14.0 hr
Minus 40° F	Plus 10° F	13.6 hr	11.1 hr	8.0 hr	4.0 hr	0.5 hr
	0° F	18.1 hr	15.4 hr	12.5 hr	8.9 hr	4.8 hr
	Minus 10° F	23.7 hr	21.0 hr	18.2 hr	14.5 hr	10.4 hr
Minus 50° F	Plus 10° F	12.0 hr	9.6 hr	6.8 hr	3.1 hr	0.3 hr
	0° F	15.8 hr	13.2 hr	10.6 hr	7.4 hr	3.9 hr
	Minus 10° F	20.6 hr	17.4 hr	15.0 hr	12.0 hr	8.3 hr
Minus 60° F	Plus 10° F	10.4 hr	8.3 hr	5.7 hr	2.1 hr	0.2 hr
	0° F	13.6 hr	11.5 hr	9.2 hr	6.3 hr	3.2 hr
	Minus 10° F	17.3 hr	15.1 hr	12.7 hr	10.3 hr	6.8 hr

Note. The same length of time is required to condition a jato from a low to high temperature as is required to condition a unit from a high to low temperature. For example, if 24.8 hours is required to condition a unit stored in a 75° F. ambient temperature to 10° F. when exposed to a −10° F. environment an equal length of time (24.8 hrs.) is required to restore the jato to the original temperature when stored in a 75° F. environment.

79. Selection and Construction of Storage Sites

Add the following note:

Note. Sites for the storage of guided missile propellants at NIKE tactical installations should be located in specifically designated areas approved by the Commanding General, U. S. Army Air Defense Command or the appropriate theater commander.

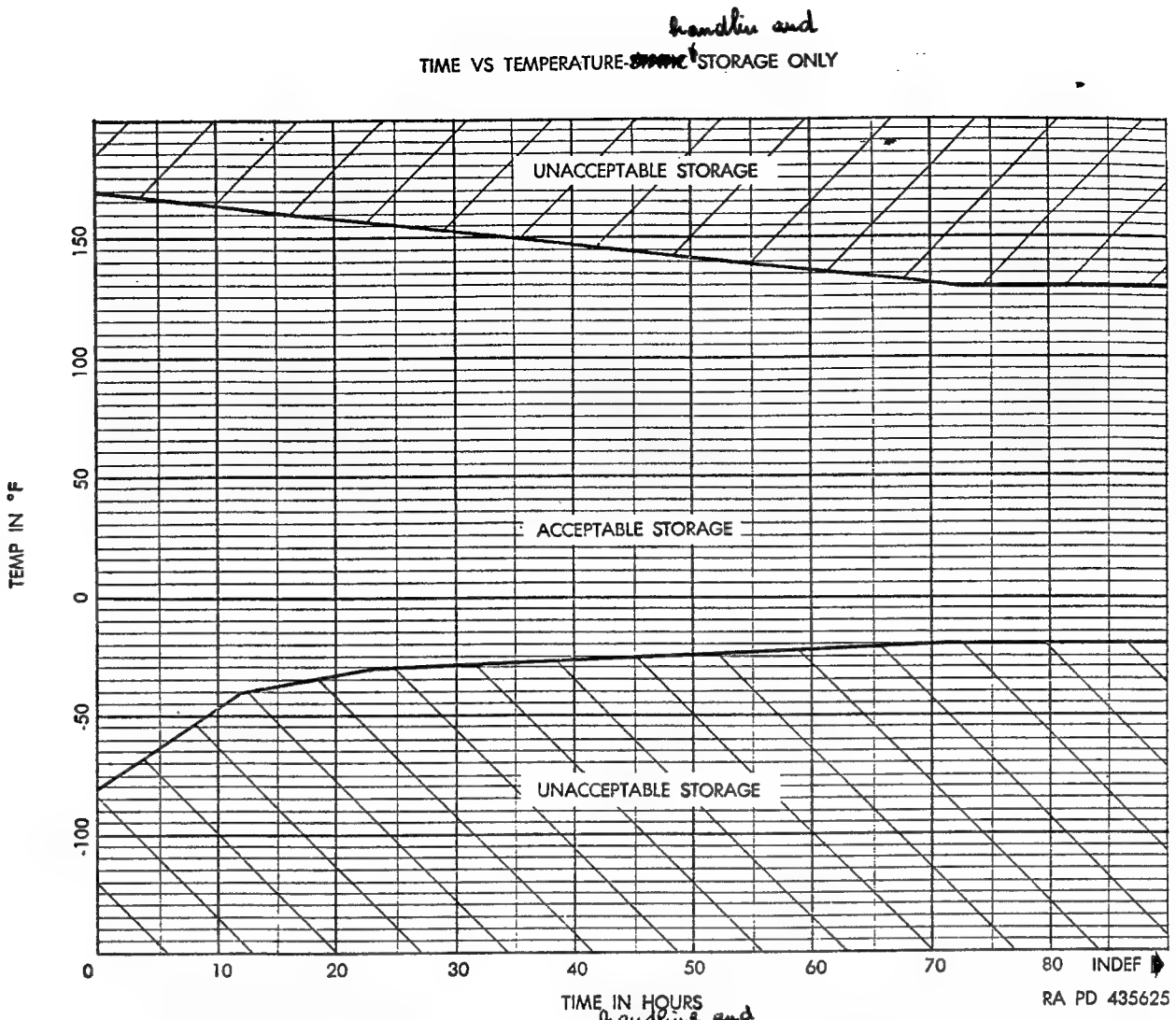

Figure 41.1 (Added) *Time versus temperature (handling and storage only) for M5 or M5E1 JATO.*

85. UDMH

* * * * *

d. Special Handling Instructions. Proper training of * * * at all times. During disposal operations, handling equipment and containers must be electrically grounded. In all operations * * * in table III.

[AG 471.6 (24 Feb 58)]

* * * * *

By Order of *Wilber M. Brucker*, Secretary of the Army:

MAXWELL D. TAYLOR,
General, United States Army,
Chief of Staff.

Official:
HERBERT M. JONES,
Major General, United States Army,
The Adjutant General.

Distribution:
Active Army:

DCSLOG	Corps	Ord Arsenals
CNGB	Div	Mil Dist
ASA	Ord Gp	Ord Proc Dist
Technical Stf, DA	Ord Bn	MAAG
Ord Bd	Ord Co	Mil Mis
USCONARC	Ft & Camps	JBUSMC
USA Arty Bd	Svc Colleges	JUSMAG (Greece)
USA Armor Bd	Br Svc Sch	Fld Comd, AFSWP
USA Inf Bd	USA Ord GM Sch	Units organized under following TOE's:
USA Air Def Bd	PMST Sr Div Ord Units	19–177
USA Abn & Elct Bd	Ord Ammo Comd	44–145
USA Avn Bd	Gen Depots	44–146
USA Arctic Test Bd	Ord Sec, Gen Depots	44–147
US ARADCOM	Ord Depots	44–446
OS Maj Comd	Ports of Emb (OS)	44–447
Log Comd	Trans Terminal Comd	44–448
CinCUSAREUR	Army Terminals	
MDW	OS Sup Agcy	
Armies	Ord PG	

NG: State AG; units—same as Active Army.
USAR: None.
For explanation of abbreviations used, see AR 320–50.

TAGO 4058A

U. S. GOVERNMENT PRINTING OFFICE: 1958

TECHNICAL MANUAL
NO. 9–1970–2

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., *21 February 1958*

AMMUNITION:
ANTIAIRCRAFT GUIDED MISSILE M1 (NIKE-AJAX)
IDENTIFICATION, DESCRIPTION, PACKING, CARE, HANDLING, PRESERVATION, AND DESTRUCTION

* This manual supersedes TM 9–1970–2, 4 March 1957, including C 1, 20 June 1957; TB 9–1970–2/1, 7 November 1956, including C 1, 17 December 1956, C 2, 1 February 1957, and C 3, 13 September 1957; TB 9–1970–2/2, 28 December 1956, including C 1, 1 February 1957; TB ORD 658, 26 October 1956; and those portions of TB ORD 660, 8 November 1956, including C 2, 4 February 1957, and C 3, 16 October 1957, pertaining to the materiel covered herein.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

This manual is for the use of personnel concerned with the identification, care, handling, shipping, and limited storage of the packaged components necessary to assemble a complete round of the Antiaircraft Guided Missile M1 (NIKE-AJAX) and its components. It does not cover in detail the missile guidance section, hydraulic system, or propulsion system (other than liquid propellants).

2. Other Publications

Information concerning the missile guidance section, hydraulic system, and propulsion system can be found in ~~TM 9-5001-19~~ TM 9-5012-1. Other related publications are listed in the appendix.

3. Forms, Records, and Reports

a. General. Forms, records, and reports serve necessary and useful purposes. Responsibility for the proper use and execution of all forms and reports rests with the local commanding officer.

b. Authorized Forms. DA Pam 310–2 is an index of authorized blank forms. Requis for blank forms will be submitted in acco with AR 310–1.

c. Accident Reporting. SR 385–10–4(scribes the method of reporting injuries t sonnel or damage to materiel. These repo required by the Army Safety Program.

d. Reports of Malfunctions and Accide volving Ammunition and Explosives (I Training and Combat). Reports of ac involving guided missile ammunition will mitted in accordance with SR 700–45–6

e. Damaged or Improper Shipments. Da or improper shipments will be reported Form 6 (Report of Damaged or Improp ment) in accordance with AR 700–58.

f. Ammunition Condition Report. This will be used in requesting disposit tions for unserviceable or obsolete am components, or to indicate disposition which has been taken on hazardous item report will be prepared in accordance v 755–140–1.

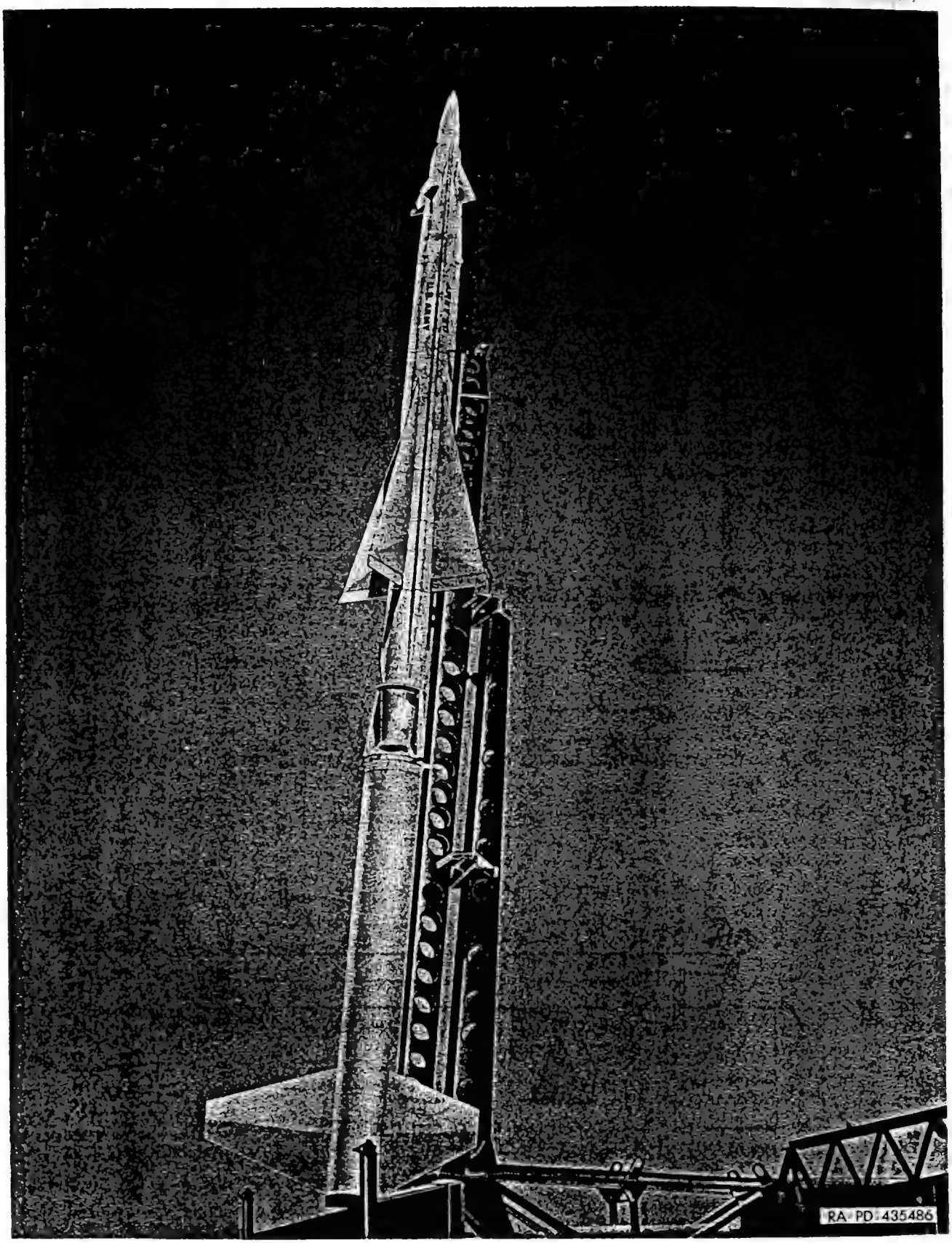

Figure 1. Antiaircraft guided missile M1 (NIKE-AJAX) on launcher-loader M26.

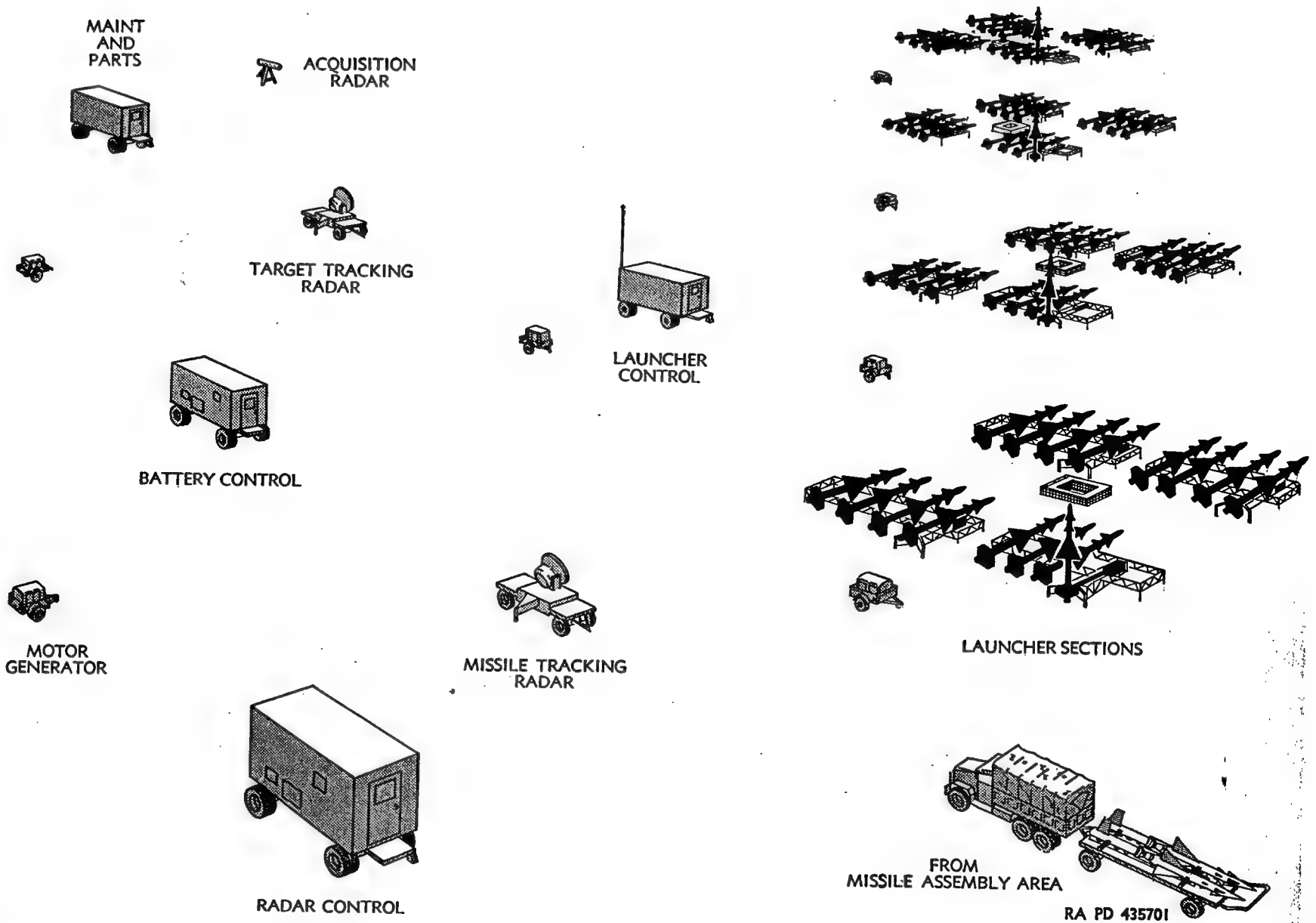

Figure 2. Battery type installation.

AGO 4059A

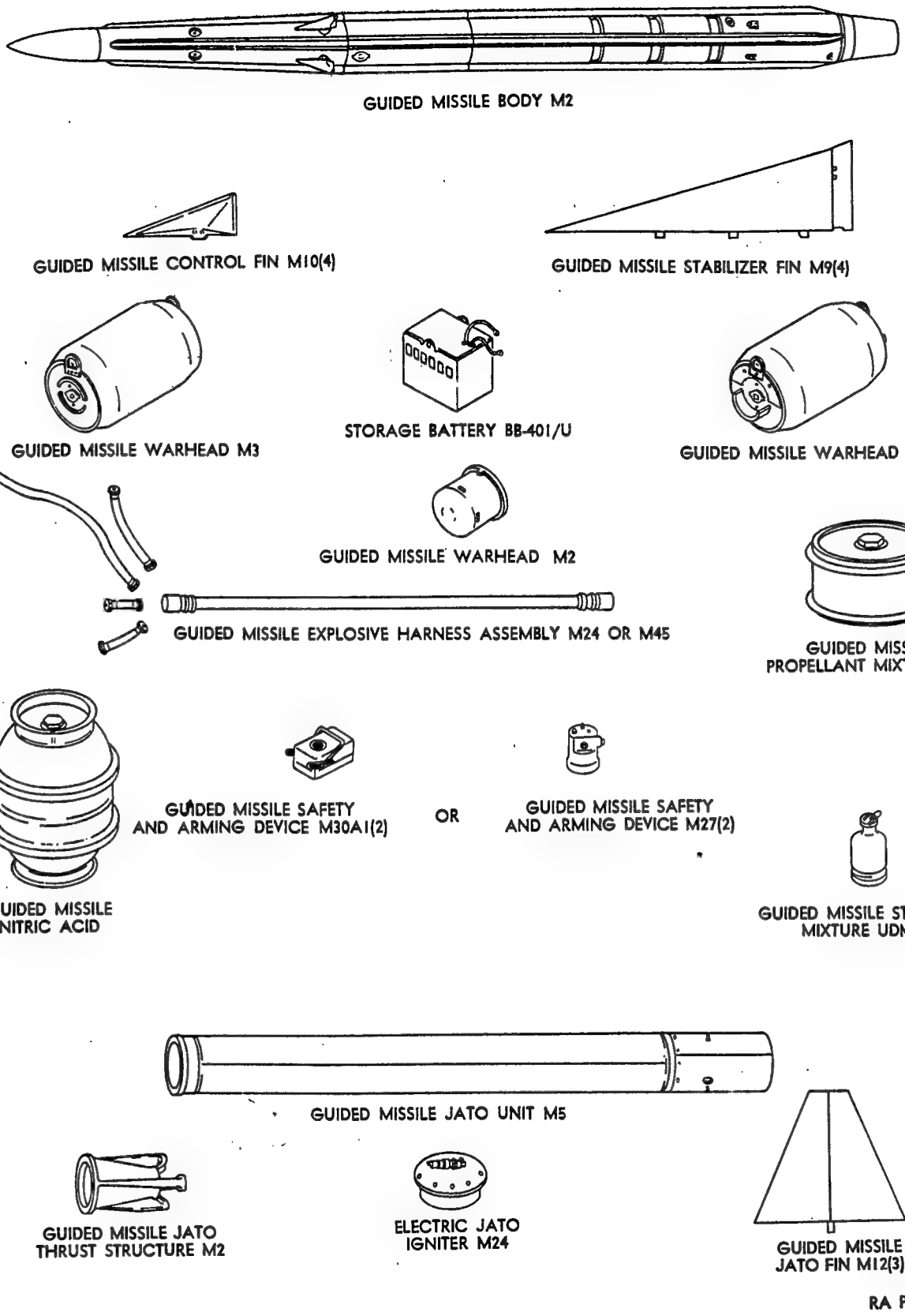

Figure 3. Separately packaged components of antiaircraft guided missile M1.

4. NIKE-AJAX System (fig. 2)

The NIKE-AJAX system is designed to acquire, intercept, and destroy high speed and high altitude enemy aircraft operating outside of the capabilities of conventional antiaircraft artillery. By means of an acquisition radar, targets are detected and identified as friend or foe. The targets are tracked in range, elevation, and azimuth by target tracking radar. Electronic computers convert the target position data into high frequency radio steering commands which are sent to the missile by a missile tracking radar, enabling the missile to intercept and destroy the target. The NIKE-AJAX battery consists of three tactical areas: an assembly and test area, a battery control area, and a launching area. The assembly and test area is adjacent to the launching area and contains all the equipment necessary to unpack, assemble, fuel, and check out the missile. The battery control area contains the radar and electronic components needed to acquire targets, to track targets and missile, to compute data, and to transmit steering commands to the missile. The launching area includes the equipment required to perform final tests and to launch ready missiles. Further information on the missile system can be found in TM 9–5001–1.

5. Antiaircraft Guided Missile (fig. 1)

Antiaircraft guided missile M1 is a 2-stage, surface-to-air missile fired from a monorail-type launcher. It is initially accelerated by a solid propellant jato unit which separates from the missile after burnout. A pressure-fed liquid propellant sustainer motor is activated upon separation of the jato unit and provides the missile with sustaining thrust. An electronic guidance section within the missile body provides the beacon signal necessary for ground-based radar tracking of the missile. The guidance section also receives, demodulates, and amplifies incoming signals. These amplified signals are used to activate hydraulically operated ailerons and fins which establish and maintain proper altitude and path control of the missile. The destructive power of the missile is provided by the simultaneous detonation of three high-explosive, fragmentation-type warheads within the missile body. The signal for the detonation of these warheads is supplied by the guidance section. For further information on the mis[illegible], see TM 9–5001–22.

6. Missile Components (fig. 3)

a. General. Authorized components, quantities per complete round, approved nomenclature, and former nomenclature are given in table I.

b. Packaging and Marking. The components are packed in pressurized, dehumidified metal containers; aluminum drums and bottles; and wooden ammunition boxes or crates. These various containers are marked to completely identify contents. Further information on packing and marking can be found in chapter 3.

Table I. Authorized Components

Approved nomenclature	Quantity per complete round	Former nomenclature
BATTERY, STORAGE: BB–401/U.	1	BATTERY, storage, BB–401/U.
BODY, GUIDED MISSILE: M2 or XM2.	1	BODY, guided missile, XM2 or XM2E1.
EXPLOSIVE HARNESS ASSEMBLY, GUIDED MISSILE: M24 or M45.	1	CORD ASSEMBLY, detonating, M24 (T7E2) or M45.
FIN, CONTROL, GUIDED MISSILE: M10.	4	FIN, control, guided missile, XM10.
FIN, JATO, GUIDED MISSILE: M12.	3	FIN, jato, guided missile, XM12.
FIN STABILIZER, GUIDED MISSILE: M9.	4	FIN, stabilizer, guided missile XM9.
IGNITER, JATO ELECTRIC: M24.	1	IGNITER, jato, electric, XM24A1.
JATO UNIT, GUIDED MISSILE: M5.	1	JATO: M5, (XM5).
NITRIC ACID, GUIDED MISSILE.	242 ± 1 *	NITRIC ACID, fuming technical, type III.
PROPELLANT MIXTURE, GUIDED MISSILE: M3.	49 ± 0.5 *	FUEL, rocket engine, M3.

Table I—Continued.

Approved nomenclature	Quantity per complete round	Former nomenclature
SAFETY AND ARMING DEVICE, GUIDED MISSILE: M27.	2	ARMING MECHANISM, safety, M27 (T93E8).
SAFETY AND ARMING DEVICE, GUIDED MISSILE: M30 or M30A1.	2	ARMING MECHANISM, safety, T90E3 or M30A1.
STARTING MIXTURE, GUIDED MISSILE: unsymmetrical dimethylhydrazine (UDMH).	1.07-lbs*	UNSYMMETRICAL DIMETHYLHYDRAZINE.

Table I—Continued.

Approved nomenclature	Quantity per complete round	Former nomenclature
THRUST STRUCTURE, JATO, GUIDED MISSILE: M2.	1	THRUST STRUCTURE, jato guided missile, XM2.
WARHEAD, GUIDED MISSILE: M2.	1	WARHEAD, fragmentation 12-lb, T26E4.
WARHEAD, GUIDED MISSILE: M3.	1	WARHEAD, fragmentation, 179-lb T37E3, w/initiator.
WARHEAD, GUIDED MISSILE: M4.	1	WARHEAD, fragmentation, 122-lb T38E2, w/initiator.

* One container as packed and issued.

Note. This manual also covers the separately packaged and issued delay lines and antennas, GS 18114 series, which are components of the missile body.

Section III. IDENTIFICATION, NOMENCLATURE, AND PHYSICAL DATA

7. Identification

a. Classification. The missile is classified according to use as antiaircraft and according to purpose as service or training. Service missiles are used for destruction missions in combat or combat training; training missiles are inert missiles used for familiarization of troops and for drill purposes.

b. Station System of Reference. Specific locations on the completely assembled missile are expressed in "stations." A station location is a distance in inches on the missile measured aft from the foremost tip of the nose. For example, the lift point of the missile is at station 140.90, i.e., at 140.90 inches aft of the tip of the nose. It is important that all references to locations on the missile be expressed according to this system.

c. Model Designation.

(1) When an item with a particular design is adopted as a type, it is given a model designation which becomes a part of the nomenclature and is included in the marking of the item. The present system of model designation for standardized items consists of the letter M and a number. Modifications are indicated by the addition of the letter A and appropriate numbers; e.g., M1A1 represents the first modification to an original model M1. The suffix B in a model designation indicates that the item is of substitute or alternate design, material, or manufacture. A minor experimental change to any item designated by an M number will require the assignment of the letter E followed by an appropriate number as a suffix to the M number.

(2) The model numbers of experimental or developmental (nonstandard) items are usually prefixed by the letter T. However, guided missile equipment of this nature is prefixed with the letters XM. Modifications of T items are indicated by the suffix E and appropriate number. Modification of XM items are expressed in the same way. Thus, XM329E1 indicates the first modification to an experimental or developmental model, XM329. Upon standardization of experimental or developmental models, a corresponding change is made; i.e., XM329E1 becomes M329. A minor experimental change of any item designated by an M number will require the assignment of the letter E followed by an appropriate number as a suffix to the M number.

d. Lot Numbers. For certain ammunition components, a lot number is assigned in accordance with pertinent specifications. A "lot" consists

of a number of items which are manufactured under similar conditions from similar materials and which may be expected to function alike. The lot number found on ammunition components consists of the manufacturer's initials or symbol and a number for the lot itself. The lot number is required in all references to specific items in records and reports.

e. Ammunition Data Cards. These 5- x 8-inch cards are prepared for designated explosive components. They contain nomenclature, lot number, weights, test data, and other pertinent information. These cards are forwarded to the consignee with individual shipments and are retained for record.

f. Painting and Marking. Missile components are painted primarily to prevent corrosion or rust and secondarily to provide identification as to type and to provide camouflage. Certain explosive components are painted in accordance with color coding outlined in TM 9–1900. Containers for liquid propellants are color coded in accordance with Mil-Std–172 to indicate types of hazards. Components are marked by stenciling or stamping with all information necessary for complete identification.

g. Serial Numbers. Certain nonexplosive missile components are identified by serial numbers rather than lot numbers. When used, serial numbers are required for all records and reports referring to specific items.

h. Logbooks. Each missile is provided with a logbook. This book is similar in function and content to the weapon record book (gun book) issued with conventional antiaircraft artillery guns. Historical and technical data concerning inspections, maintenance, and modifications performed on the missile are entered in this logbook. Portions of the logbook are CONFIDENTIAL and must be handled in accordance with AR 380–5. Whenever a missile is returned to Ordnance, the logbook, if classified, must be placed in an envelope and taped to the guidance section of the missile body. The logbook receptacle on the missile shipping container will be used only for unclassified logbooks and shipping documents.

8. Nomenclature

a. General. An item of supply is identified by an approved item name for all supply operations. This name is used in all Department of the Army supply manuals and must be used in all records, forms, and reports pertaining to specific missile components.

b. Federal Stock Numbers and Department of Defense Interchangeability Codes. Ammunition identification code (AIC) symbols have been replaced by Federal stock numbers (FSN). The FSN consists of an initial group of four digits indicating the Federal supply classification (FSC) and a succeeding group of seven digits indicating the Federal item idenitification number (FIIN). There is a different FIIN for each item of supply. A Department of Defense (DOD) interchangeability code has been suffixed to the FSN of FSC 1,300 items. This code consists of a letter and three numbers, and it groups together items which are interchangeable in function and use. Whenever the same DOD interchangeability code is added to two or more FSN's, the items are interchangeable for issue and use. Using units will requisition items by FSC and DOD interchanageability code, e.g., 1336–V160. Where particular items, models, or packs are desired, they will be requisitioned by FSN and DOD code with a justification for such issue shown on the requisition. Further information on FSN's can be found in Department of the Army supply manuals.

9. Physical Data

a. Missile.

Antennas	10.35 in. (chord), 3.00 in. (height)
Control fins	20.30 in. (chord), 24.60 in. (circular span)
Length	251.00 in.
Maximum diameter	14.64 in. (including tunnels)
Stabilizer fins	72.00 in. (max chord), 50.00 in. (circular span)
Weight	1,190.60 lb (gross), 450.00 lb (empty)

b. Jato Unit.

Fins	37.10 in. (chord), 86.30 in. (circular span)
Length including thrust structure	158.00 in.
Length without thrust structure	136.00 in.
Maximum diameter	16.20 in.
Weight	1,208.00 lb (loaded), 458.00 lb (empty)

CHAPTER 2

DESCRIPTION OF MISSILE COMPONENTS

Section I. EXPLOSIVE COMPONENTS

10. General

Only those components which present an explosive hazard will be considered in this section.

11. Guided Missile Safety and Arming Device M27 (fig. 4)

a. General. This device insures that the missile warheads will remain unarmed prior to and during launching and arms them during flight.

b. Description. The primary component of the device is a movement assembly housed in a black, cylindrical, aluminum casting. The movement assembly is composed of a delay timer, a rotor assembly and housing, and a rack assembly and gear train. The device is 3½ inches high, 2½ inches in diameter, and weighs approximately 1½ pounds.

Note. Two identical devices are used in each missile. They are connected in parallel to increase functional probability. They can be visually inspected through the transparent plastic windows in the missile body, but, unlike the M30 model, they cannot be installed or removed through these windows.

12. Guided Missile Safety and Arming Device M30 (fig. 5)

a. General. Like the M27, the M30 safety and arming device insures that the missile warheads will remain detonator safe prior to and during initial launching, and provides a safe method of arming them in flight.

b. Description. The M30 safety and arming device is a plug-in "fuze-type" arming device. It consists basically of a slide and brass G-weight, a clockwork delay assembly, a contact block, and a latch assembly mounted on a cast aluminum base. The slide contains two electrical contacts and an M51 detonator. The delay assembly is a clockwork mechanism. The contact block is plastic and has two sets of contacts: one set maintains a short across the M51 detonator when the device is unarmed, and the other set completes the firing circuit when the device is armed.

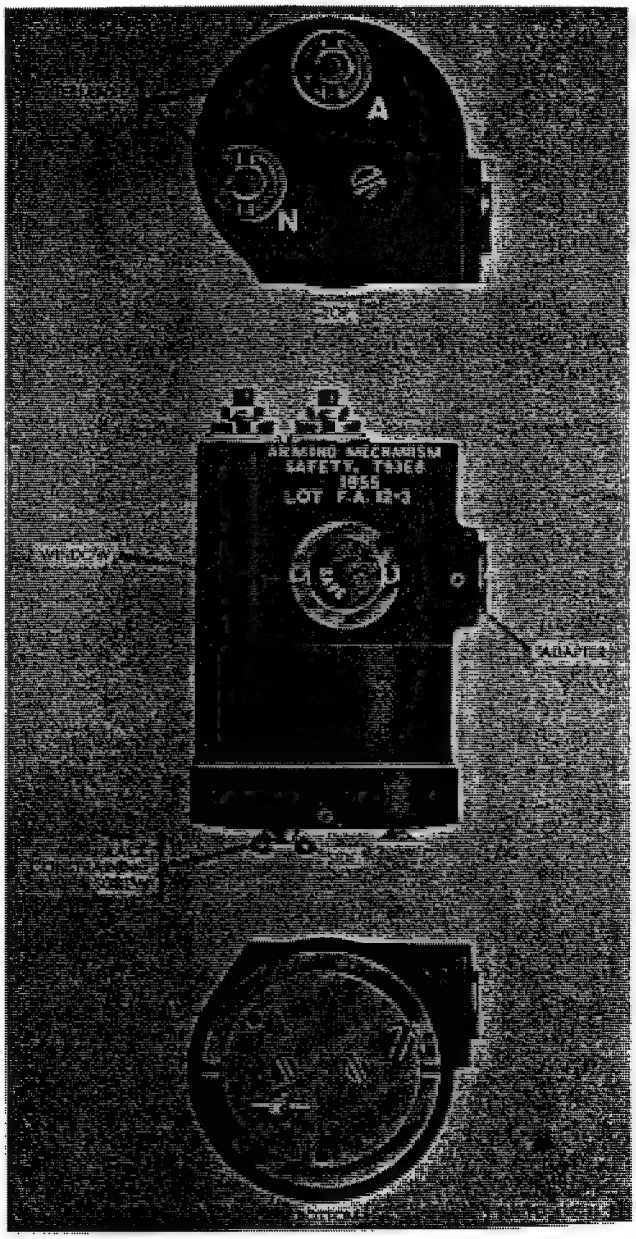

Figure 4. Safety and arming device M27 (T93E3).

The base has 2½ grain tetryl lead. An aluminum cover, with an internal copper screen and a bail (lifting ring), protects the internal mechanism of the device. The cover attaches to the base by four screws. The device is protected from accidental arming during handling and transportation. The letter S (safe) or A (armed) printed on top of the G-weight is visible through the window in the cover of the device. The device is 2⅘ inches long, 1½ inches wide, and 1½ inches high. It weighs 1¼ pounds and contains a total explosive content of 5½ grains.

c. Mounting. The mounting plate for the device has a connector block with an internal filter network to prevent stray high frequency voltages from prematurely detonating the device. It also has a connector for attachment of the explosive harness lead. Leads from the electrical harness of the missile attach to terminal studs on the connector block. The mounting plate attaches to brackets within the center body section. When the mounting plate is installed in the missile body, the safety and arming device can be plugged in and removed through the window in the center body section.

13. Guided Missile Safety and Arming Device M30A1 (fig. 6)

a. General. The M30A1, like the M30 safety and arming device insures that the warheads will remain unarmed prior to and during launching, and provides a safe method of arming them in flight.

b. Description. The external appearance of the M30A1 differs from that of the M30 in the following:

(1) The bail (lifting ring) is a looped, curving device (fig. 6) which serves as a retaining spring to aid in maintaining the proper position of the device when installed.

(2) The UNARMED position is indicated by the white color visible through the window in the cover. The ARMED position is indicated by the red color visible through the window.

Note. Two M30 or M30A1 safety and arming devices are used in each missile. They are connected in parallel to increase functional probability. Both devices may be visually inspected and installed through the transparent plastic windows in the missile body.

14. Guided Missile Explosive Harness Assemb. M45 (fig. 7)

This assembly consists of five lengths or leads of detonating cord with PETN filler. Each lead has a coupling nut and a PETN relay cap on one end and an aluminum connector and a PETN relay cap on the other end. The female coupling nut of each lead attaches to a metal 5-way connector secured to the forward ring of the center body section. The aluminum connector on the other end of the lead screws into an adapter in either the safety and arming device mounting plate or the warheads. The detonating cord has a plastic cover with a maximum diameter of 0.235 inches. In addition to these characteristics, lead No. 10 is protected by a metal conduit assembly which consists of a flexible metal covering, a copper retainer, and a brass sleeve on each end. The length and function of the individual leads are as follows:

Lead	*Length*	*Connects to—*
No. 9	8.66 in.	Left side, Safety and Arming Device
No 2	70.02 in.	Warhead M2
No. 10 w/ conduit	27.62 in.	Warhead M3
No. 4	158.32 in.	Warhead M4
No. 11	15.21 in.	Right side, Safety and Arming Device

Note. The M45 explosive harness assembly is to be used with the M30 and M30A1 safety and arming devices. Each lead is identified by a small metal tag with the appropriate lead number.

15. Guided Missile Explosive Harness Assembly M24

Like the M45, this assembly consists of five leads of detonating cord which are connected at one end to a 5-way connector attached to the missile body and at the other to either the warheads or the safety and arming devices. It differs from the M45 in that lead No. 3, which connects with the center warhead, is not equipped with a conduit assembly. The length and function of the individual leads are as follows:

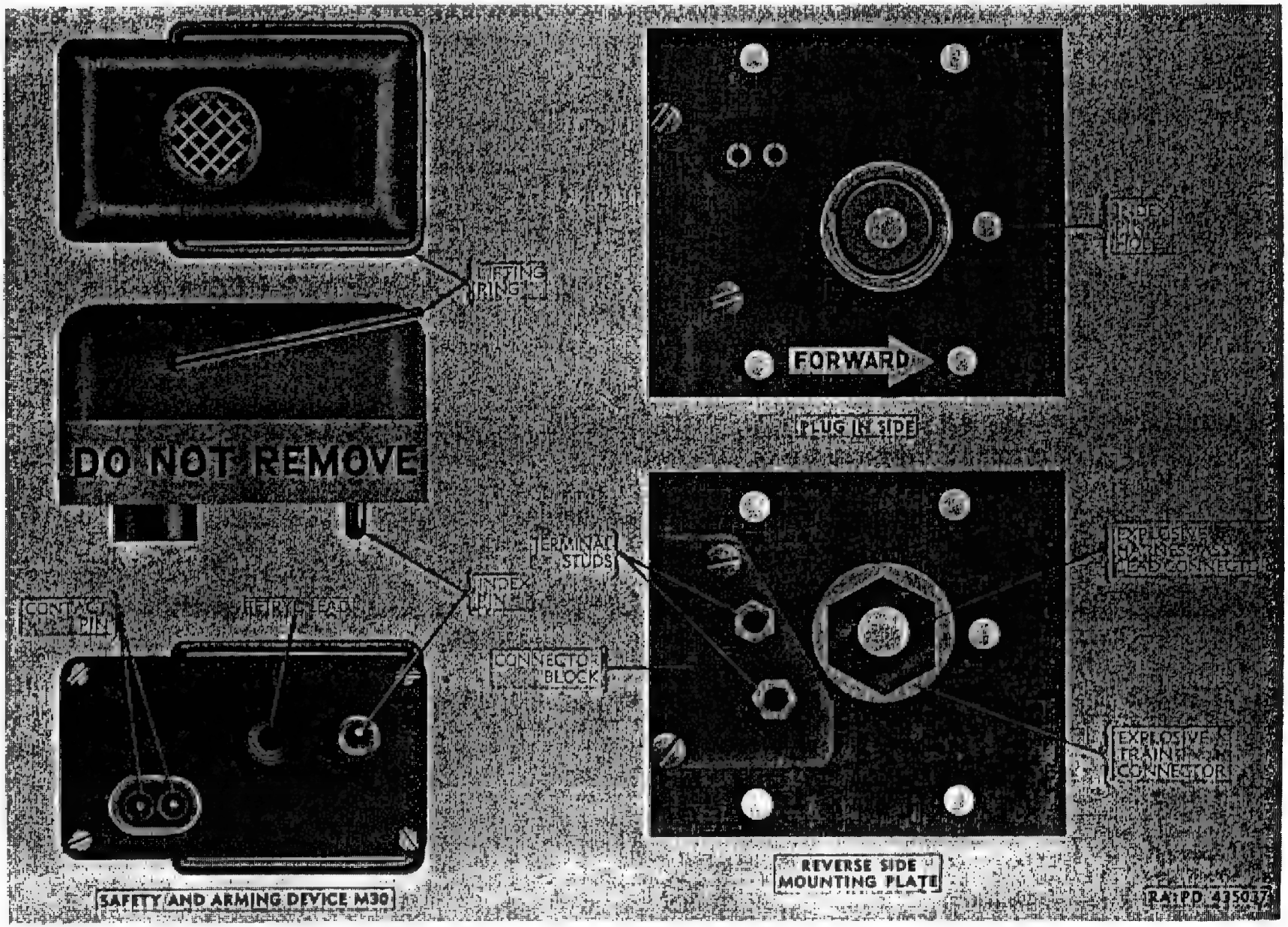

Figure 5. Safety and arming device M30 and mounting plate.

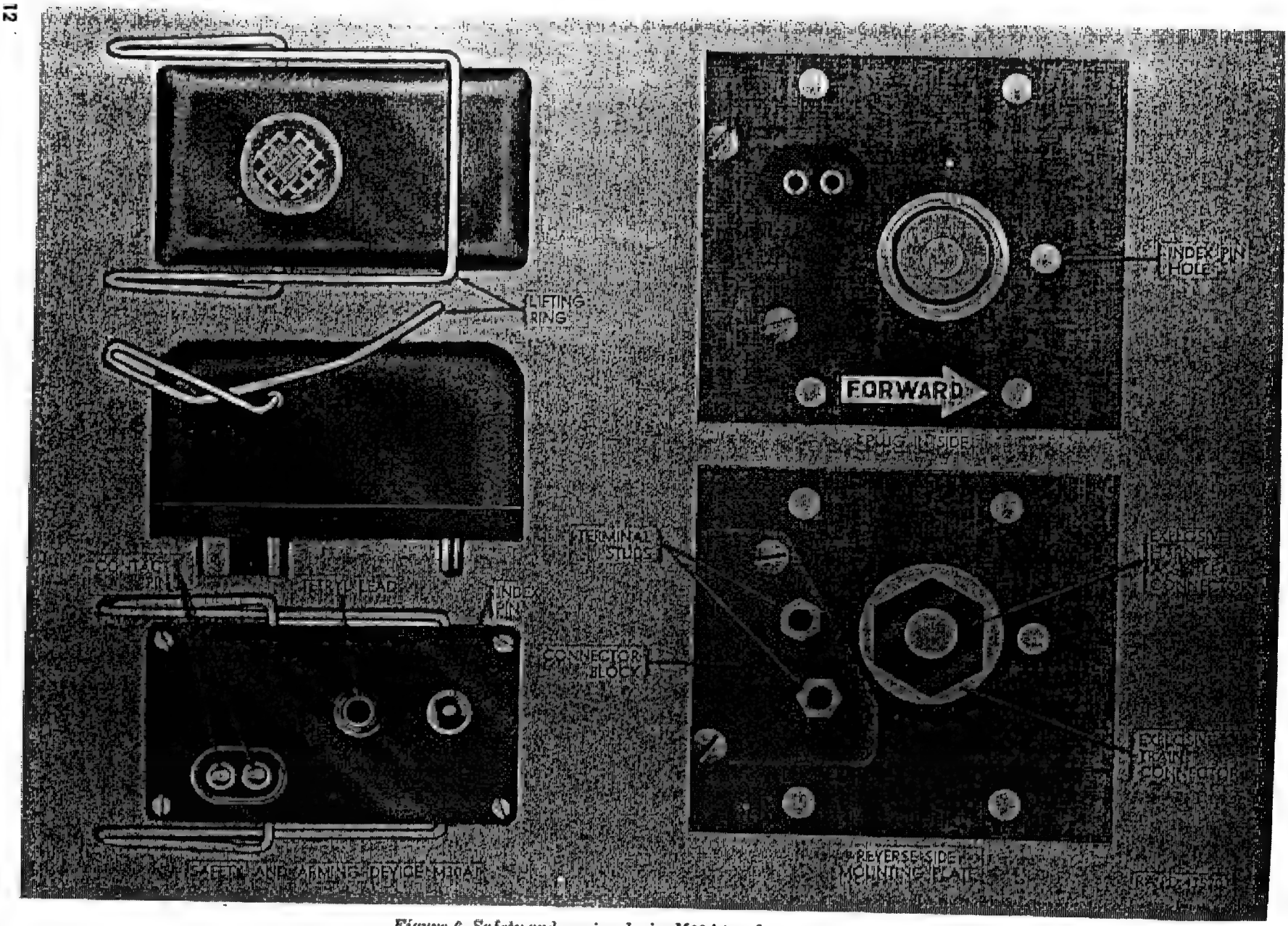

Figure 6. Safety and arming device M30A1 and mounting plate.

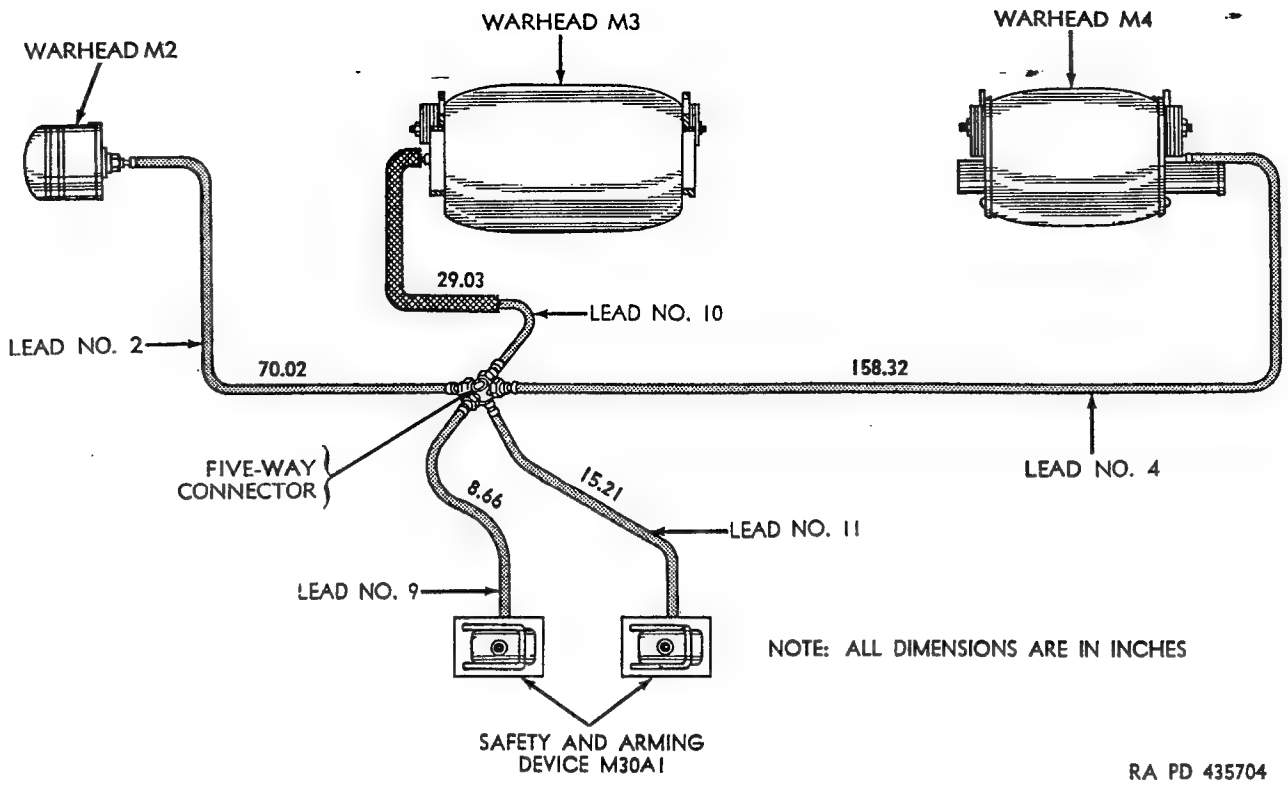

Figure 7. Schematic view of explosive harness assembly M45.

Lead	*Length*	*Connects to—*
No. 1	8.66 in.	Left side, Safety and Arming Device
No. 2	70.02 in.	Warhead M2
No. 3	27.62 in.	Warhead M3
No. 4	158.32 in.	Warhead M4
No. 5	15.21 in.	Right side, Safety and Arming Device

Note. The M24 explosive harness assembly is used with the M27 safety and arming device. Each lead is identified by a small metal tag with the appropriate lead number.

16. Guided Missile Warhead M2 (fig. 8)

The M2 fragmentation warhead is located in the nose section of the missile body. The warhead consists of a cylindrical steel body, and a dome-shaped head covered by two layers of preformed fragments. The body contains a bursting charge of approximately 4.5 pounds of Composition B and a small tetryl booster. The base of the warhead contains a threaded adapter which accepts the connection of lead No. 2 of the explosive harness assembly. An aluminum shipping plug protects the booster adapter until the lead is installed. The warhead is held in place by a flange on the nose base and the warhead retaining ring. The warhead is painted olive-drab and marked in black. Marking on the warhead includes the nomenclature, weight, model number, type of explosive filler, lot number, date loaded, and loaded weight to the nearest tenth of a pound. Two yellow bands around the body indicate the type of explosive filler. This warhead is 5⅕ inches in diameter and 6⅖ inches high. It weights approximately 12 pounds.

17. Guided Missile Warheads M3 and M4 (fig. 9)

The M3 and M4 fragmentation warheads are respectively located in the center and aft sections of the missile body. These warheads consist of ellipsoidal bodies over which is inlayed a single layer of preformed fragments in a plastic matrix. The fragments are retained by an aluminum cover. Each warhead has a bursting charge of Composition B. Both warheads have integral metal lifting eyes on either end. Removable initiators (aluminum inclosed lengths of primacord with PETN relay caps at each end) are installed in each warhead. These initiators are in contact with tetryl boosters embedded near the center of the bursting charge. The initiators

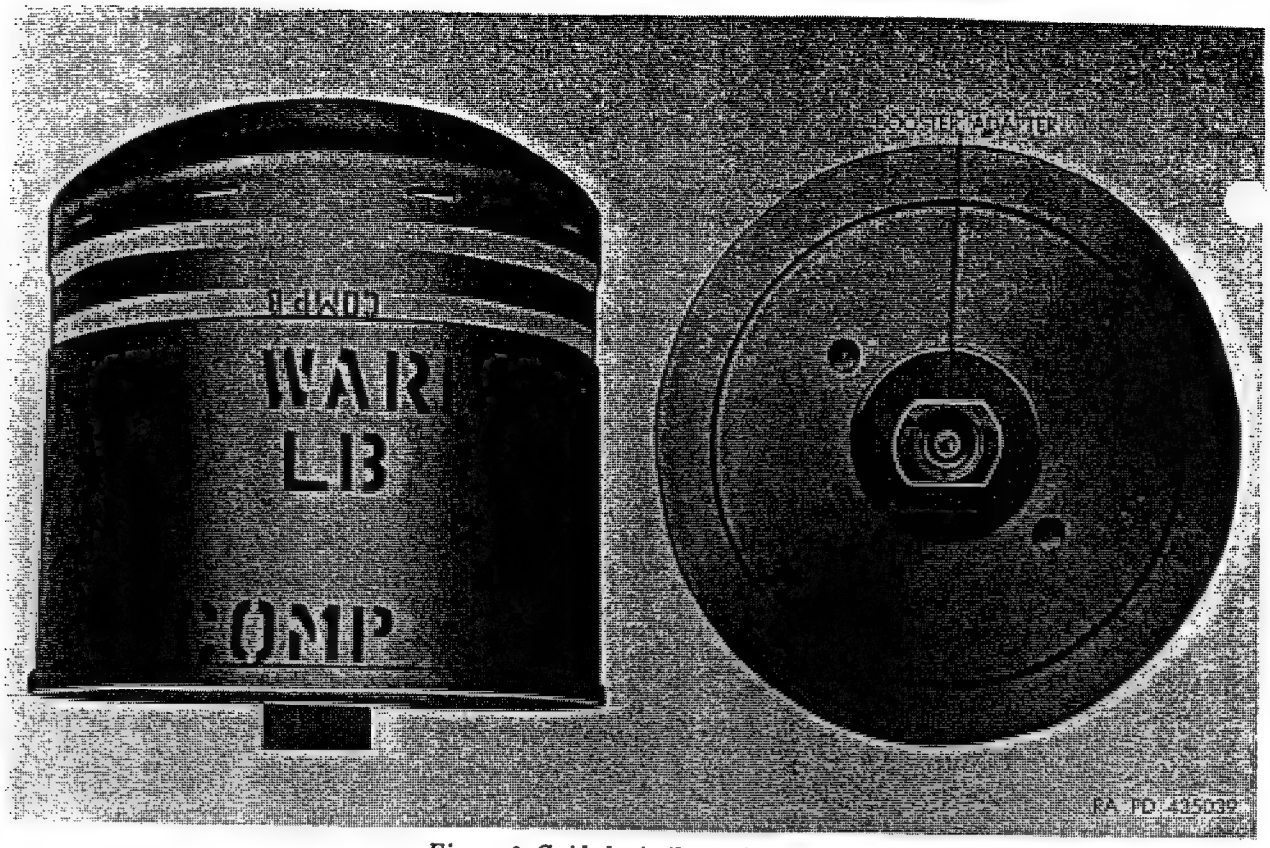

Figure 8. Guided missile warhead M2.

transmit the explosive wave from the explosive harness lead to the booster. The initiator adapters, which provide for the attachment of the explosive harness leads, are protected by threaded aluminum plugs during shipment. The warheads are painted olive-drab and marked in black. Markings on the warheads include nomenclature, weight, model number, type of explosive filler, lot number, date loaded, and weight to the nearest tenth of a pound. Two yellow bands around each end of each warhead body indicate the type of explosive filler.

a. Warhead M3. The forward mounting adapter of the M3 warhead attaches by anchor lugs and bolts to the forward ring bracket of the center body section. The aft end attaches in the same manner to a fitting on the oxidizer tank. The M3 warhead contains approximately 92 pounds of explosive filler and has an overall length of 23 inches. It has a maximum diameter of 11 7/10 inches and weighs 176¾ pounds.

b. Warhead M4. The mounting adapters of the M4 warhead attaches to the forward and aft mounting brackets by lugs and bolts. The M4 warhead contains approximately 59 pounds of explosive filler and has an overall length of 21½ inches. It has a maximum diameter of 11 1/10 inches and weighs 121¼ pounds.

18. Electric Jato Igniter M24 (fig. 10)

The igniter is an electrically actuated device that ignites the propellant grain in the combustion chamber of the Jato unit. It screws into the steel head of the jato. A special spanner wrench is used to install the device. The igniter consists of a dome-shaped, cadmium-plated steel head and a cylindrical cup made of polystyrene. The head is secured to the cup by a grommet and a snap ring. The cup contains 2⅕ pounds of explosive (a mixture of several grades of black powder) and four resistors and four M1A1 squibs connected in series-parallel. There is a plastic filling plug in the bottom of the cup. Two terminal studs and an electrical harness assembly on the head of the igniter connect to the resistors and squibs within the cup through a hermetically

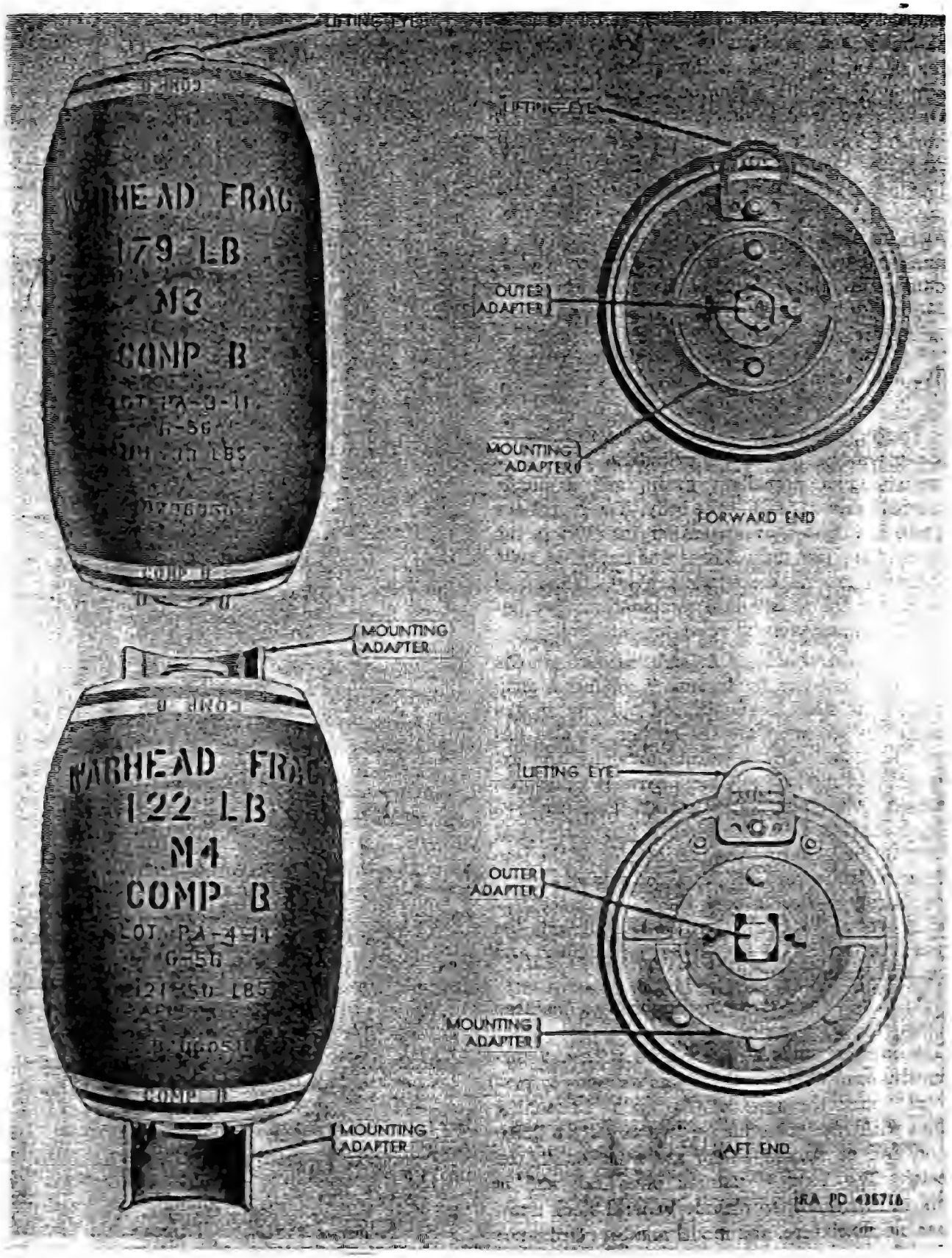

Figure 9. Guided missile warheads M3 and M4.

sealed bolt. The total resistance of the harness assembly and resistors is 20 (±2) ohms. A female coupling plug on the igniter harness assembly mates with a plug on the jato unit head. Until it is coupled, a shorting plug on the igniter harness plug prevents stray currents from initiating the igniter. Once connected, the shorting plug on the aft end of the jato harness protects the igniter circuits from stray electrical currents. Markings on the cup include nomenclature, model number, lot number, part number, loader, date loaded, and contract number. The igniter is 5½ inches in diameter and 3½ inches high. The igniter weighs 9 pounds.

19. Jato Unit M5
(fig. 12)

The jato unit is a rocket motor consisting of a removable steel head, a cylindrical steel body containing a propellant grain, and a nozzle welded to the aft end of the body. The propellant grain is initiated by an igniter installed in the head of the jato unit. Three fins located at 120° intervals around the nozzle provide stability in flight for the missile-jato combination. See figure 12 for cutaway view of the jato unit.

a. Head Assembly. A helical steel spring holds the head in place by forcing it against a snap ring. The head has a tapped opening in the center to accommodate the igniter. It also has two insulated terminal posts to which the external and internal electrical harness assemblies attach. A tap plug for hydrostatic pressure testing is also located on the head. A plastic shipping plug in the head protects the interior of the jato from moisture, dirt, etc., and also acts as a blowout safety device in case the grain is accidentally ignited. Markings on the head include the part number, drawing number, lot number, and manufacturer's name.

b. Body. The body is the combustion chamber consisting of a welded cylinder of sheet steel. The interior surfaces are coated with a flame-mastic compound of rubber and asbestos to prevent "burn through" of the wall. Launching lugs with removable plates, two at station 258.0 and two at station 364.5, are attached to the body. The body is painted olive-drab and is marked in yellow to include Federal stock number, nomenclature, and model number; Ordnance drawing number; lot number; serial number;

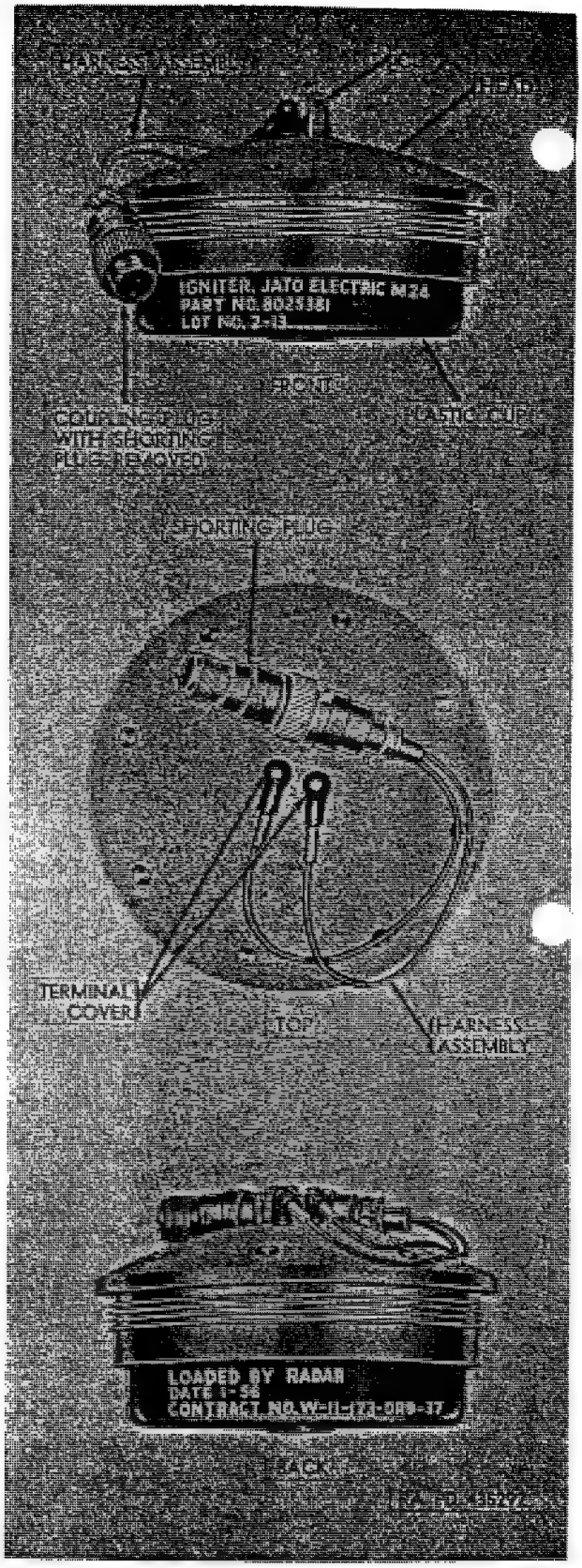

Figure 10. Electric jato igniter M24.

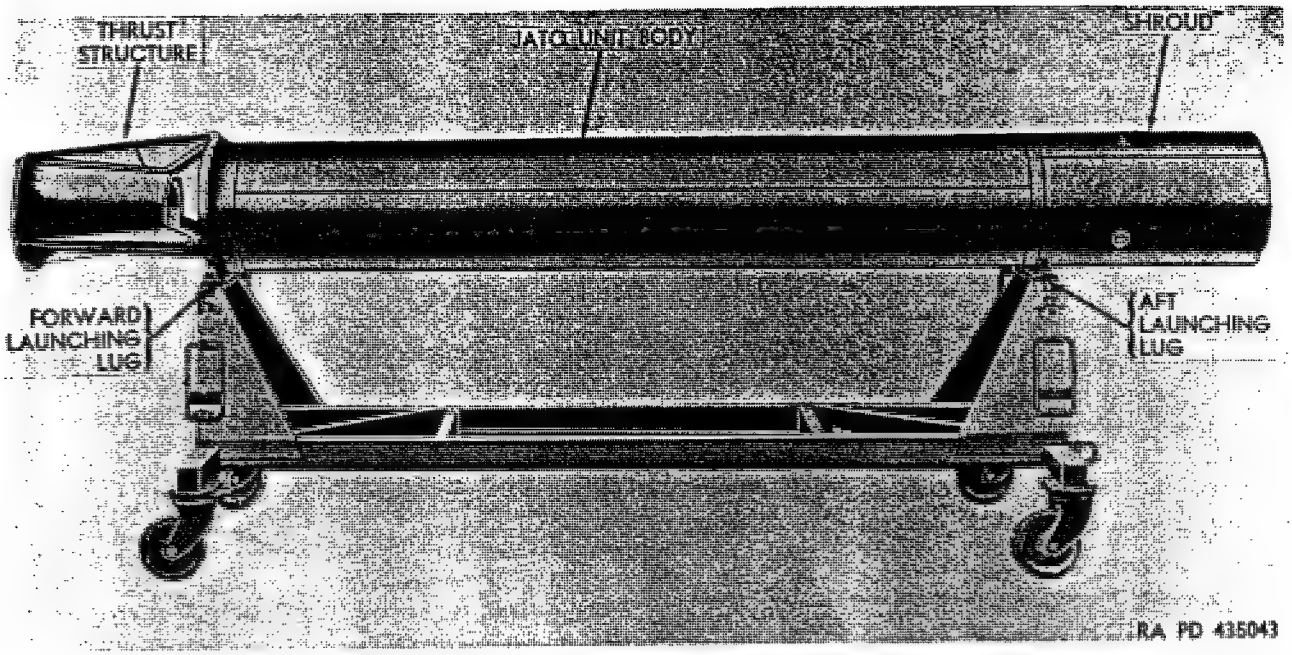

Figure 11. Jato unit M5, with thrust structure M2 assembled, on handtruck M254.

and date loaded. Printed lengthwise along the chamber are the firing temperature limits (0° to 120° F.) and the storage temperature limits (—10° to + 130°.) (see table VI).

c. Propellant Grain. The grain is a double-base, OIO type propellant cast within an inhibiting cellulose acetate liner. It is multiperforated, 102 inches long, and 16 inches in diameter and weighs approximately 750 pounds. Markings on the grain include the nomenclature, part number, drawing number, lot number, manufacturer's contract number, and date. The grain is held in place within the combustion chamber by the pressure of the helical steel spring acting against the jato head. Nine metal resonance rods, attached to a support at the forward end, extend through the perforations of the grain and act as heat distributors to prevent erratic thrust. The two electrical wires of the harness assembly, attached to terminals on the inside of the jato head, also extend through one of the perforations of the grain.

d. Nozzle. The nozzle, having a restricted throat, is that part of the motor in which the expanding gases developed in the combustion chamber are converted into kinetic energy. A nozzle closure assembly just aft of the throat protects the interior of the jato from moisture, dirt, etc., until it is fired. A sealed hole in this closure provides an outlet for the two wires of the harness assembly.

e. Wires, Fittings, and Shroud. An internal harness assembly consisting of two wires and a terminal plug attaches to studs on the inside of the head assembly and extends through the grain and the nozzle closure a distance of approximately 50 inches beyond the end of the jato. This terminal plug attaches to the launcher section firing cable. A shorting plug on this assembly filters stray currents from the igniter when this unit is assembled in the jato. Three metal mounting fittings (fin spar mounts) are attached around the nozzle and form seats for the spars of the three fins. An aluminum alloy shroud surrounds the nozzle and fittings and provides an aerodynamic fairing for the aft end of the jato body.

f. Dimensions and Weight. The assembled jato unit (including thrust structure) is 158⅘ inches long and 16½ inches in diameter. It weighs 1,208 pounds.

Note. **For general information on jatos, see TM 9-1955.**

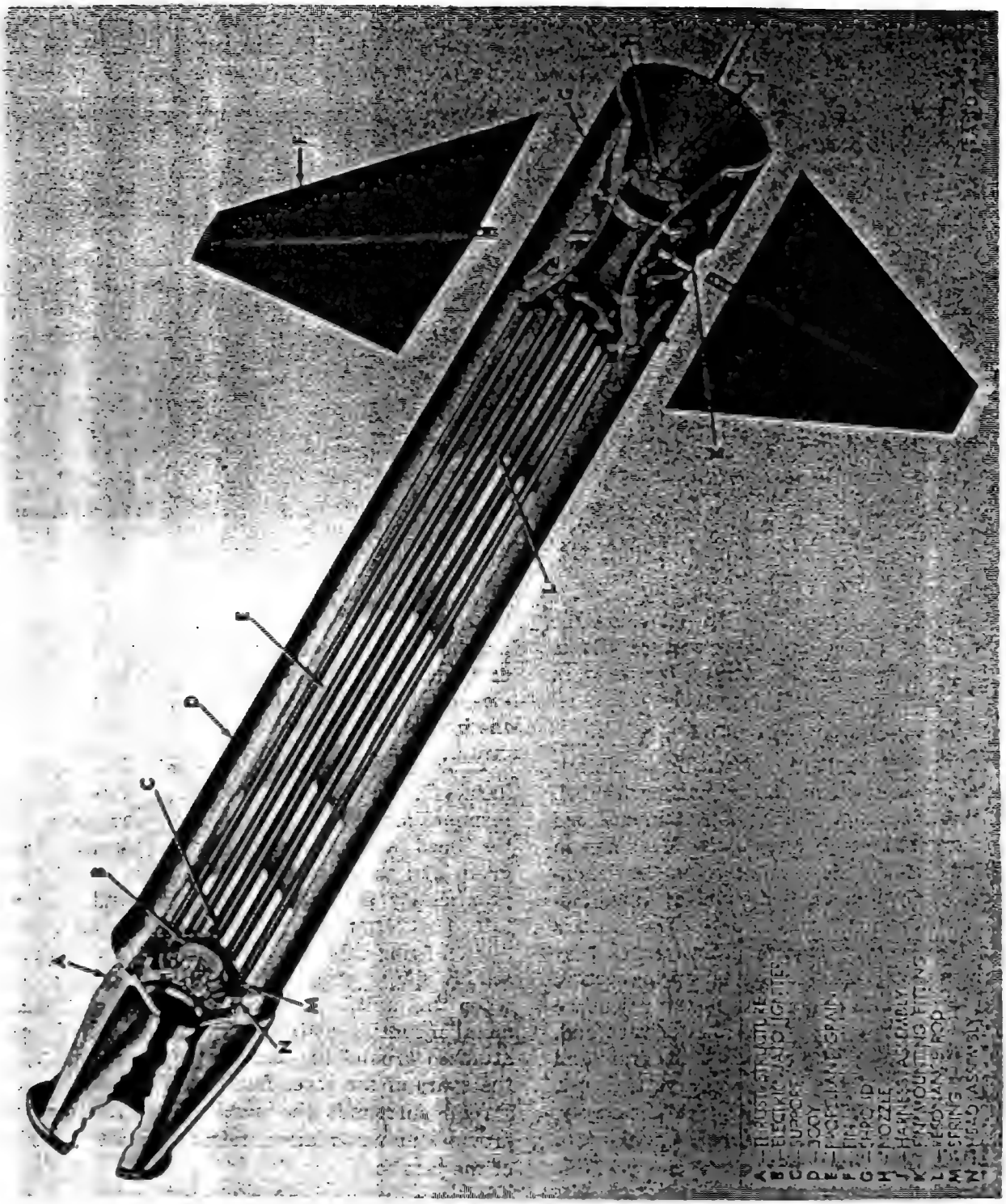

Figure 12. Jet M5, thrust structure M2, and jato fin M12, cutaway view.

Section II. NONEXPLOSIVE COMPONENTS

20. General

Only those components which are considered inert and present no hazard from explosion will be considered in paragraphs 21 through 28.

21. Guided Missile Body M2 and XM2 (fig. 13)

Both models of the body are the same in external appearance. The difference between the two is that the M2 contains the GS 16725 guidance section while the XM2 contains either the GS 15660 or the GS 17120 guidance sections. The missile airframe is constructed of aluminum skin sections and aluminum and magnesium castings. This airframe contains the guidance, control, propulsion, and explosive components necessary to propel and maneuver the missile and to destroy the target. The missile body is divided into eight functional and structural sections (*a* through *h* below) and has four tunnels running lengthwise along portions of its outer surface. The body is painted white and marked as shown in figure 14.

a. Nose Section (Sta. 0.312–26.000). The nose section consists of an aluminum-alloy skin cone riveted to a cast aluminum-alloy base and contains the stagnation pressure line and its moisture trap, the nose warhead M2, the warhead mounting ring and ballast plates, and explosive harness lead No. 2.

b. Rudder and Elevator Control Section (Sta. 26.000–44.750). This section consists of a steel hydraulic accumulator tank with a sheet aluminum-alloy fairing, a magnesium casting containing the control fin actuating shafts, the pressure regulator valve, and the manifold assembly. The forward end of the accumulator is attached to the nose assembly base by four bolts.

c. Guidance Section (Sta. 44.750–75.781). The guidance section housing is a tapered cylindrical magnesium casting. This casting is sealed so that the contents (except the battery box) can be pressurized. It contains a recessed box for the BB–401/U battery and the guidance units consisting of electronic components which receive, demodulate, and amplify the missile commands received from ground-based command equipment. Four antennas project from the housing at 90° intervals about its circumference. The guidance package transmits a signal back to the ground-based command system, providing a continuous check on the receipt of missile command signals. This section also contains path control instruments which sense missile flight performance and generate electrical signals necessary to maintain the desired flight path. The guidance section package also generates roll stabilization signals to keep the missile in a "belly down" attitude during flight. The delay line is located in this section of the missile body. The guidance section housing is attached by four bolts to the aft end of the magnesium casting of the rudder and elevator control section.

d. Center Body Section (Sta. 75.781-108.656). This section consists of top and bottom aluminum-alloy skin sections attached by screws to a forward and an aft structural ring. The section houses the center warhead M3, the two safety and arming devices, and the metal 5-way

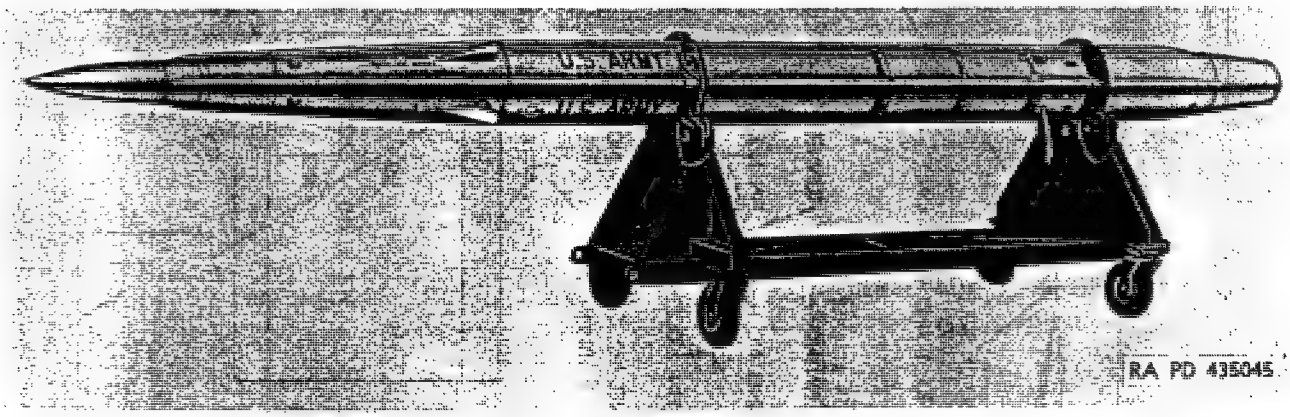

Figure 13. Guided missile body M2 on hand truck M256.

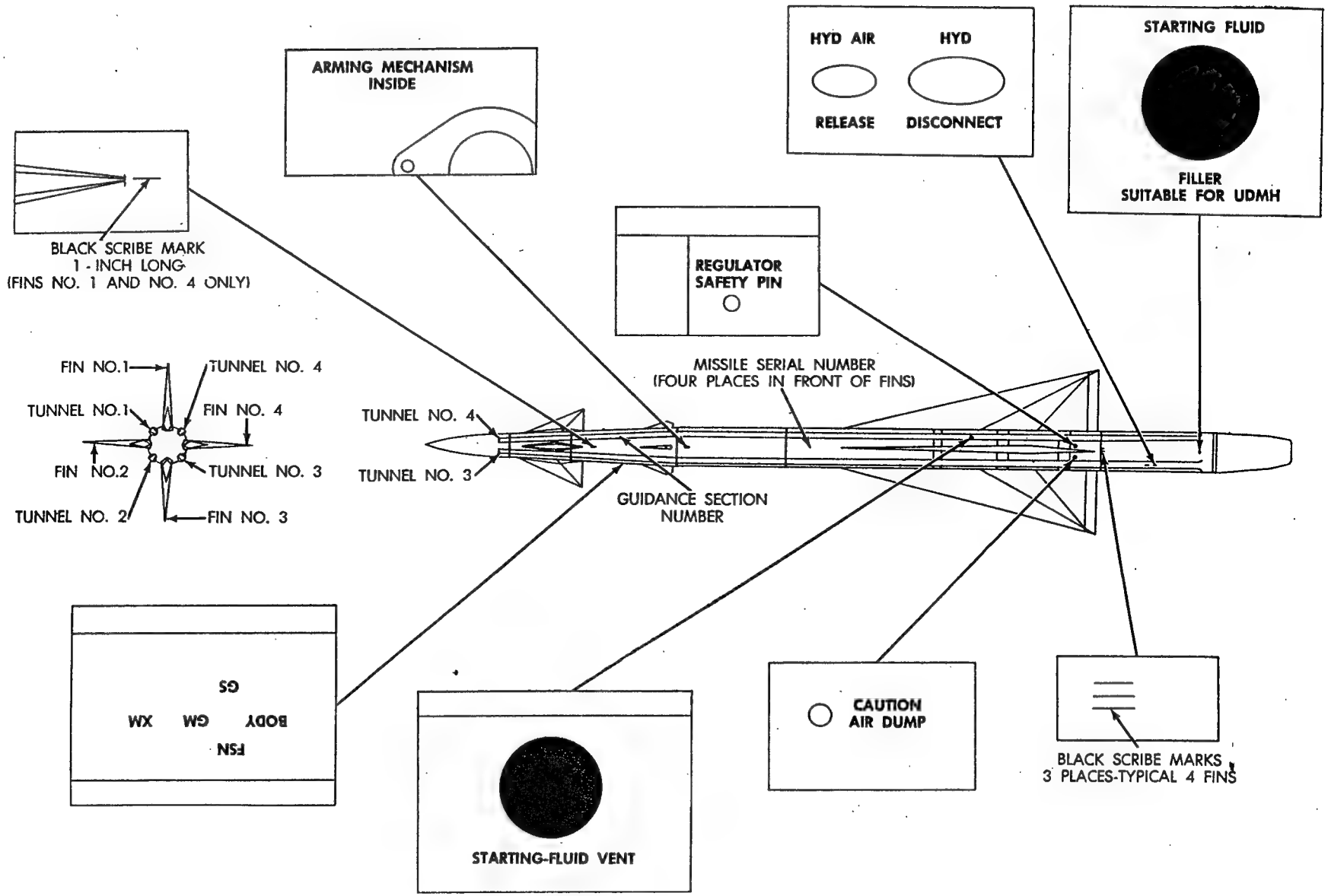

Figure 14. Markings on guided missile body M2 and XM2.

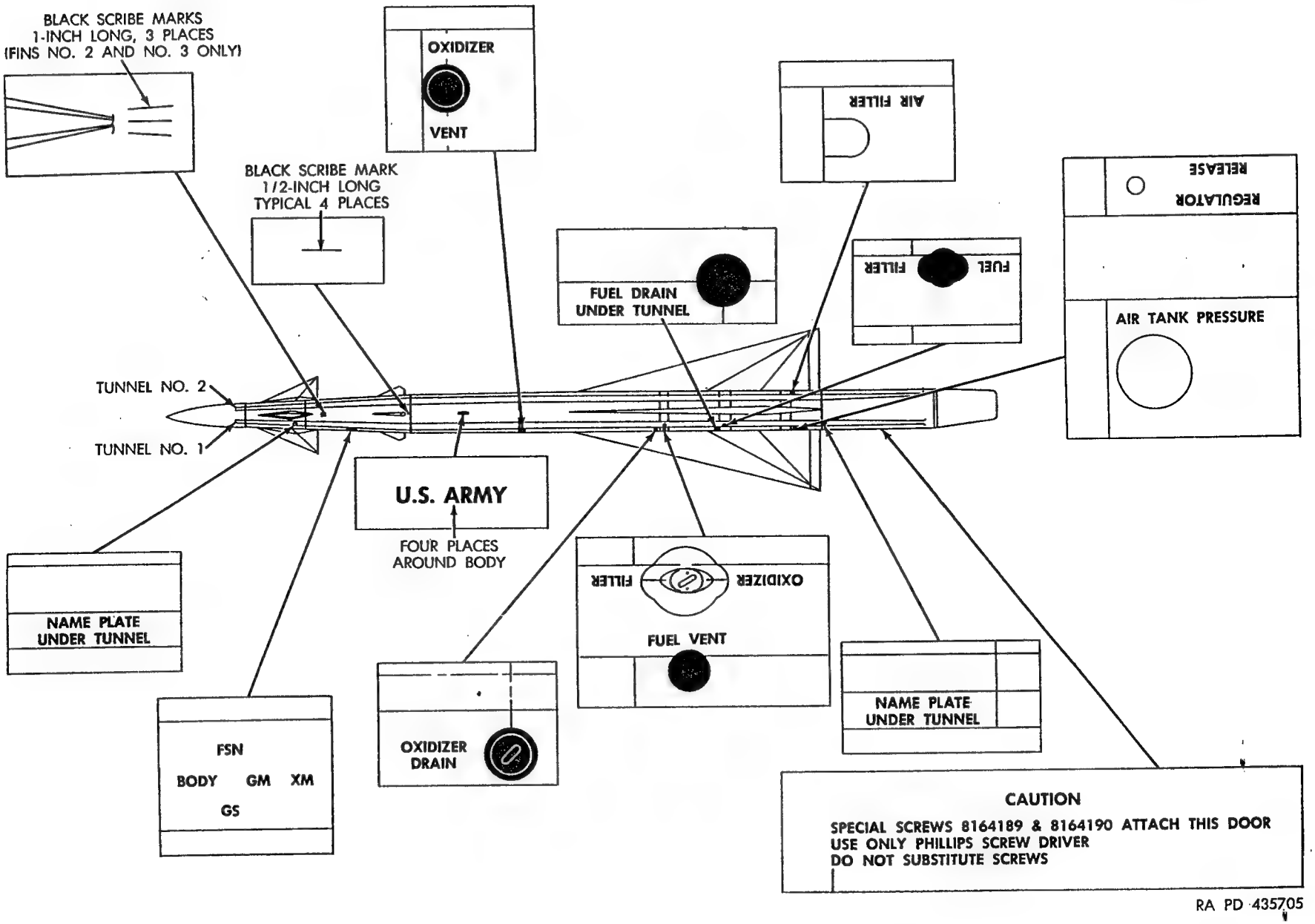

Figure 14—Continued.

fitting to which the explosive harness leads attach. Two removable transparent plastic windows in the bottom skin section permit access to the safety and arming devices. The forward structural ring is attached to the aft end of the guidance section housing by eight bolts. An index pin on the forward ring mates with a hole in the guidance section housing to insure proper alinement of the two sections.

e. Propellant Tank Section (Sta. 108.656–187.270). This section is composed of the two aluminum-alloy tanks for the oxidizer and sustaining fuel and the steel air-storage tank and pressure regulator valve for the propellant system. Aluminum fairing plates cover the open areas between tanks, continuing the aerodynamic surface of the missile body. The propellant tank section is attached to the aft structural ring of the center body section by 16 bolts.

f. Aileron Control Section (Sta. 187.270–198.625). The aileron control section consists of a cylindrical magnesium-alloy casting containing an actuator assembly, the spider assembly, and the forward and aft supports. This aileron-actuating mechanism converts the hydraulic pressure from the accumulator in the rudder and elevator control section into mechanical deflections of the four ailerons on the trailing edges of the stabilizer fins. The aileron control section is attached to the aft end of the propellant tank section by 15 bolts.

g. Aft Body Section (Sta. 198.625–251.000). This section consists of top and bottom aluminum-alloy skin sections attached by screws to an adapter ring and a magnesium-alloy casting. The skin sections inclose the M4 warhead and the air storage tank for the hydraulic system. The magnesium casting contains the sustainer motor combustion chamber and the propellant starter and fuel shutoff valve. The separation switch that activates the roll stabilization system at jato dropoff projects through a hole in the top of this casting. A lanyard, attached to the forward perimeter of the jato thrust structure, activates the dump valve switch located in the aft end of the missile body section, pressurizing the missile at jato dropoff. The aft body section is attached to the aft end of the aileron control section by 20 bolts.

h. Tunnels. Four tunnels, formed by aluminum-alloy fairings and portions of skin sections, run lengthwise at 90° intervals along the missile body from station 21.750 to station 230.750. The tunnels are numbered clockwise from the aft end, with tunnel No. 1 being on top of the missile in flight attitude. They protect the hydraulic and air pressure lines, electrical w ig, and explosive harness leads which run along the outside surface of the missile body.

Note. **For more complete details on the body, see TM 9–5001–22.**

22. Storage Battery BB–401/U (fig. 15)

This battery is located in a vented storage box under tunnel No. 1 at the forward end of the missile guidance section. The box contains an electric heating pad to maintain proper battery operating temperature. The BB–401/U is a 28-volt, nickel-cadmium battery. It consists of 24 transparent plastic cells assembled in a steel case which is painted olive-drab. Each cell has a potential of $1\frac{3}{10}$ volts and uses potassium hydroxide as an electrolyte. The steel case has slotted windows in the sides and a transparent plastic top to permit visual inspection of individual cells. The battery will deliver approximately 10 amperes continuously for a 15-minute period with output voltage variations of not more than 10 percent of its 28-volt rating. This performance is assured with the battery in any position under abnormal conditions of atmospheric pressure, acceleration, vibration, and shock. The battery is $6\frac{1}{4}$ inches long, 4 inches wide, and $6\frac{1}{2}$ inches high. It weights $11\frac{1}{2}$ pounds. Complete information on this battery can be found in TM 11–5539.

23. Guided Missile Control Fin M10 (fig. 16)

These four fins, located at 90-degree angles around the missile body at station 40.75, provide for pitch and yaw control during flight. These delta planiform fins are machined from solid aluminum-alloy extrusions. They present a double-wedge airfoil. The fins are attached to internal torque shafts by four bolts through the circular base of each fin. Each fin is painted white and has a root chord of $20\frac{3}{10}$ inches, has a span of $8\frac{3}{10}$ inches, and is $2\frac{3}{10}$ inches thick (at the base). The control fin weighs approximately $2\frac{3}{8}$ pounds.

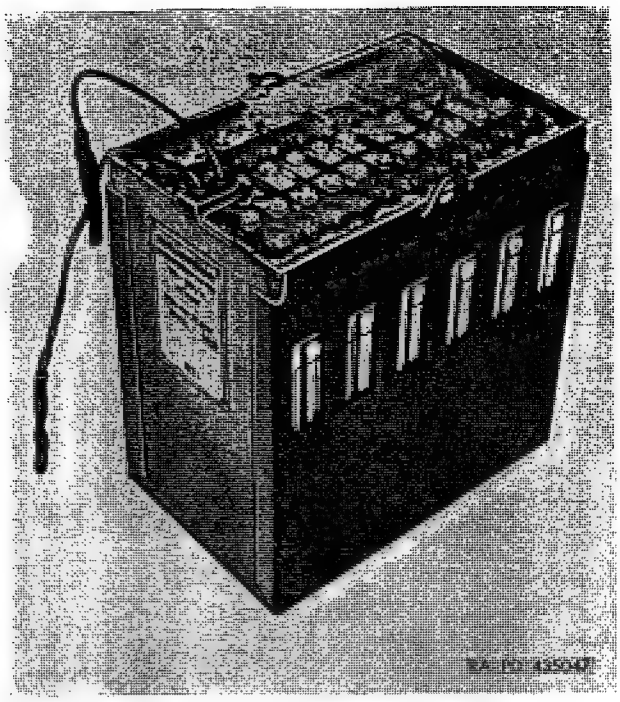

Figure 15. Storage battery BB–401/U.

24. Delay Lines, GS 15666 Series and GS 17194 Series

The delay lines are integral components of the missile guidance section. The two series perform in a similar manner, but differ in size and appearance.

a. GS 15666 Series (fig. 17). These lines are flat metal disks approximately 8 inches in diameter and ⅜ inch thick. Each disk weighs approximately 1 pound. A right-angle mounting bracket is riveted on either side of the disk, and three electrical terminals and lead wires project from the external surface. An alternate method of manufacture for this series uses a fiberglass reinforced alkyd covering instead of metal. This modified version also has the three electrical terminals projecting from a semicircular recess rather than from the external surface. The GS 15666 series of delay lines consist of six individual numbered disks and is used in both the GS 15660 and GS 17120 guidance sections. Markings on the top surface include nomenclature, individual line number, manufacturer's part number, and factory serial number.

b. GS 17194 Series (fig. 17). The lines in this series are fiberglass disks 6 inches in diameter and $2\frac{9}{32}$ inches thick. Each disk weighs 19.2 ounces. The top and bottom of each disk have recessed centers. A captive screw projects from the center of the top recess. Two electrical terminals are mounted on a shoulder of the rim of the top surface. This series consists of six individually numbered delay lines and is used in the GS 16725 guidance section only. Markings on the top surface of the delay line include drawing number, factory serial number, nomenclature, and individual line number.

25. Antennas, GS 18114 Series

These components of the missile guidance sec-

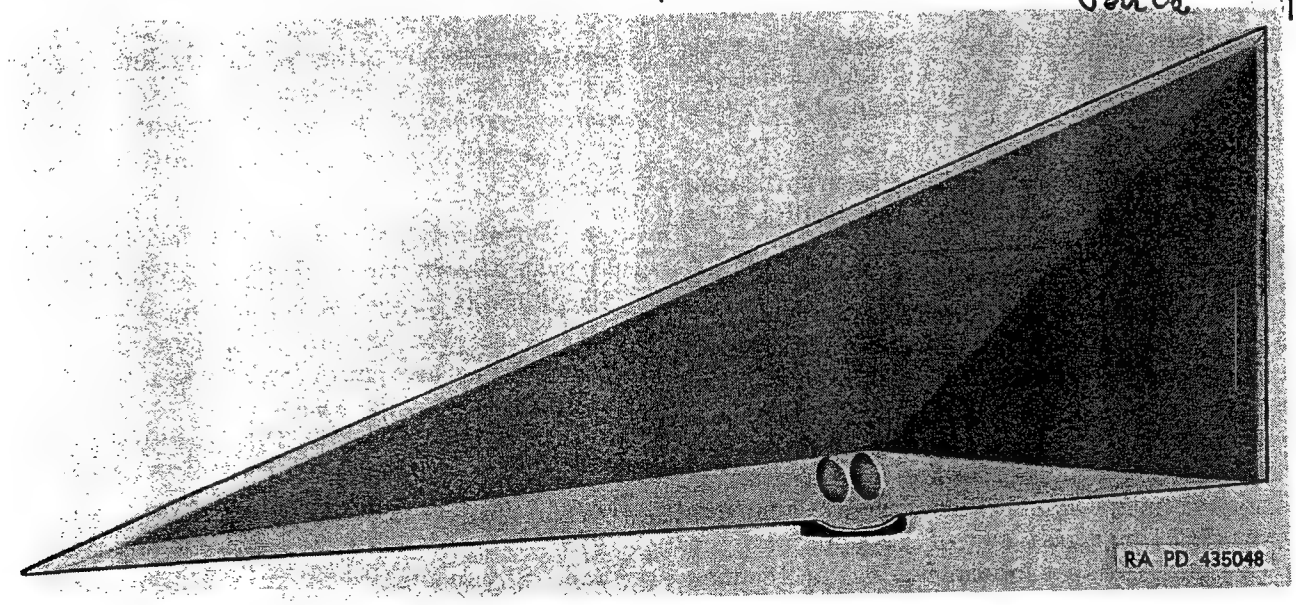

Figure 16. Guided missile control fin M10.

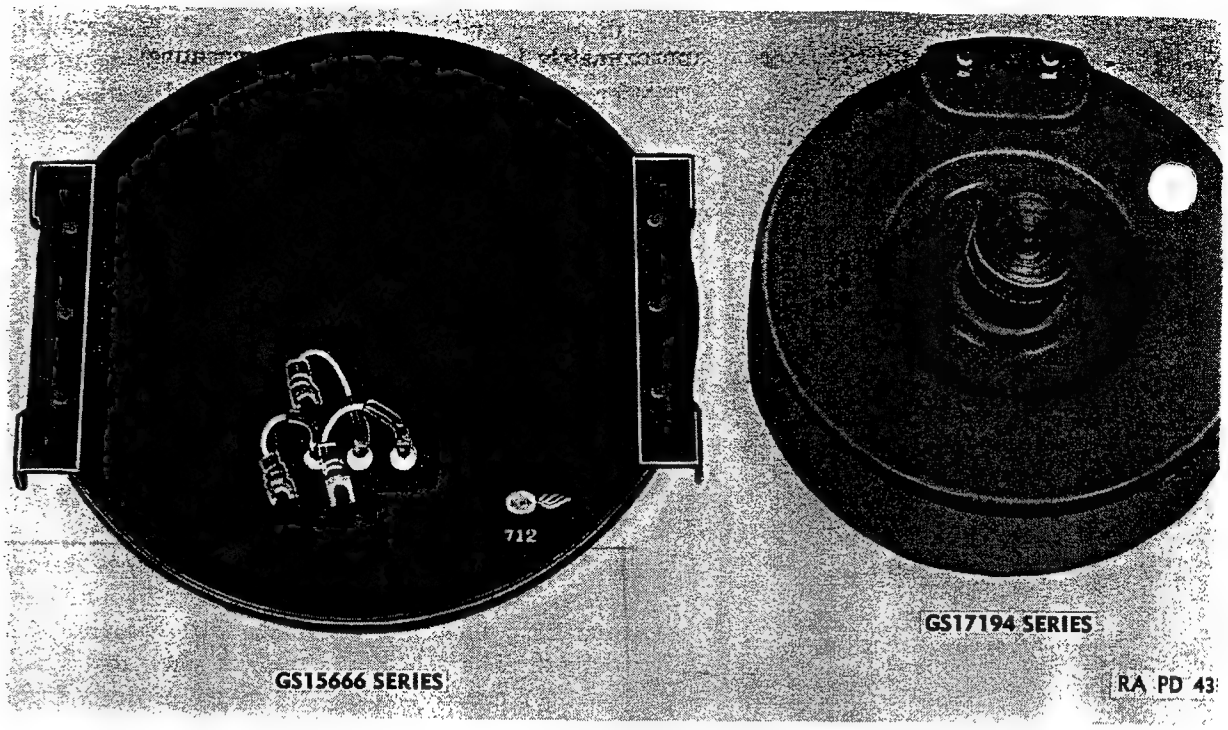

Figure 17. Delay lines GS 15666 and GS 17194 series.

tion are identical in appearance with the four missile antennas projecting from the missile body at 90° angles about station 72 and are installed for the purpose of eliminating the reception of signals from radars other than that controlling the missile.

26. Guided Missile Stabilizer Fin M9 (fig. 18)

Each of these four fins consists of a main fin and an aileron. The fins are arranged in a cruciform plan about the aft end of the missile body and provide lift and roll stabilization during flight.

a. Main Fin. This delta planiform fin is made of metal skin folded along the leading edge, bonded to an internal honeycomb paper stiffening core, and connected to cast metal fittings by screws and rivets. The fin may be made of either aluminum or magnesium, depending upon serial numbers. Fins serially numbered up to 7,850 consist of aluminum skin sections and aluminum rear main attach fittings. The forward main attach fitting and the trailing edge fitting are made of magnesium. Fins serially numbered from 7,851 upwards are of all-aluminum construction. Six tapped mounting lugs on the main attach fitting assembly provide for fin attachment to the missile body at stations 151 and 186. A pin projecting from the missile mates with a recess in the bottom of the fin attach fitting to insure proper alinement and missile body. Twenty-four sheet alun fairing covers fit over the mounting lugs tinuing the aerodynamic surface of n body.

b. Aileron. The aileron is trapezoidal in and made of solid aluminum-alloy extrusio is attached to the fitting on the trailing ec the main fin by a steel hinge pin. An inde and a shear pin at the base of the aileron to the actuating linkage of the aileron c section.

c. Dimensions, Weight, and Color. The fin with aileron has a chord of 75 inche a span of $18\frac{61}{64}$ inches, and is $1\frac{9}{10}$ inches at the base. The fins have a circular span inches. They are painted white and weig proximately 22 pounds each.

27. Guided Missile Jato Thrust Structure (fig. 19)

The thrust structure is a slip-free joint joins the jato unit to the missile body. magnesium-alloy casting in the form of

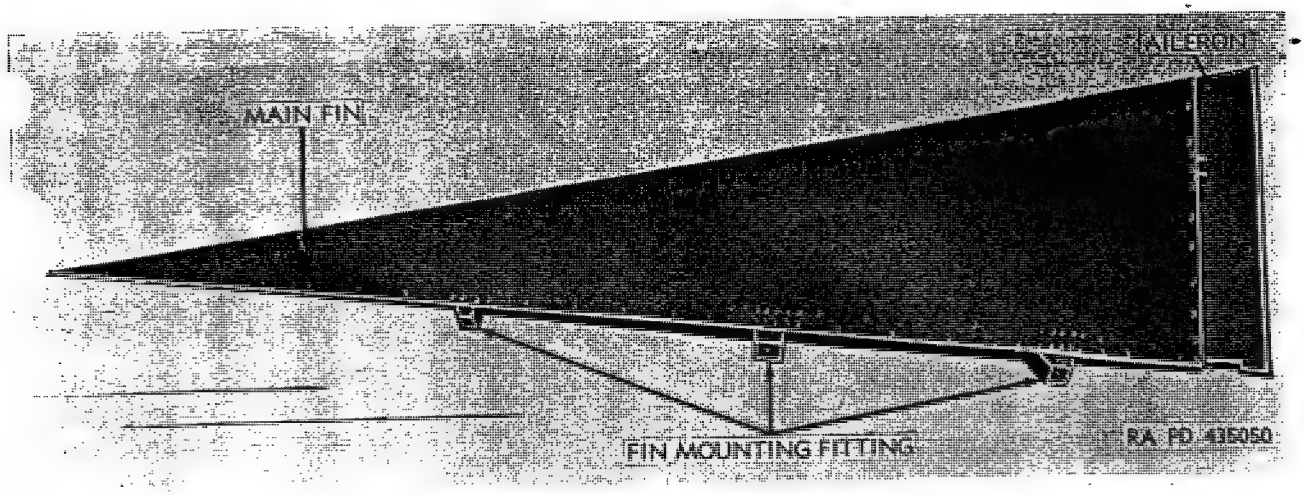

Figure 18. Guided missile stabilizer fin M9.

tressed cylindrical sleeve and is essentially a reinforced cavity having an opening at the forward end with the same diameter (12.03 inches) as the missile body at station 233.87. A hole in the forward rim of the structure admits the army lanyard from the missile body. A wooden ring inserted in the base of the cavity acts as a shock absorber and prevents binding between the aft end of the missile body and the base of the thrust structure. To provide proper alinement he jato unit and the missile body, a 2¼-inch projects through the wooden ring and mates with a hole in the missile body. Open spaces between the three buttresses permit the installation and removal of the jato igniter. The thrust structure attaches to the forward rim of the jato body by means of two bolts through the foot of each of the three buttresses. The thrust structure is 24½ inches long and 19 inches in diameter at its forward end. It weighs 31½ pounds.

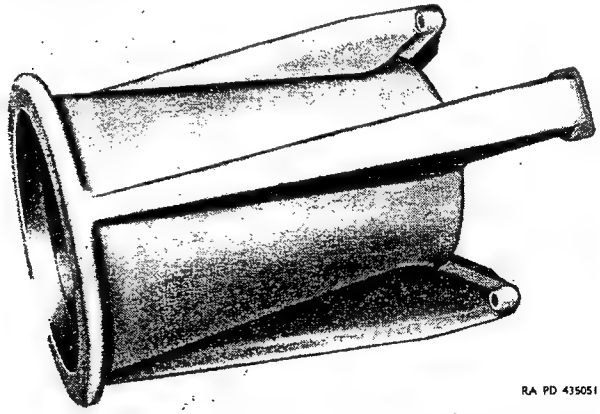

Figure 19. Guided missile jato thrust structure M2.

28. Guided Missile Jato Fin M12 (fig. 20)

These three fins attach to fin mounting fittings at 120° intervals about the throat of the jato nozzle. The fin spars are secured in the fittings by tangent setscrews. The fins provide stability for the missile-jato combination during the boost phase of flight. They are trapezoidal planiform and present double wedge profiles. Each fin is constructed of two sheet metal skin sections attached by screws to a metal spar and fin panel fitting. Internal stiffening is provided by a honeycomb paper core bonded to the skin sections. The fins are made of aluminum or

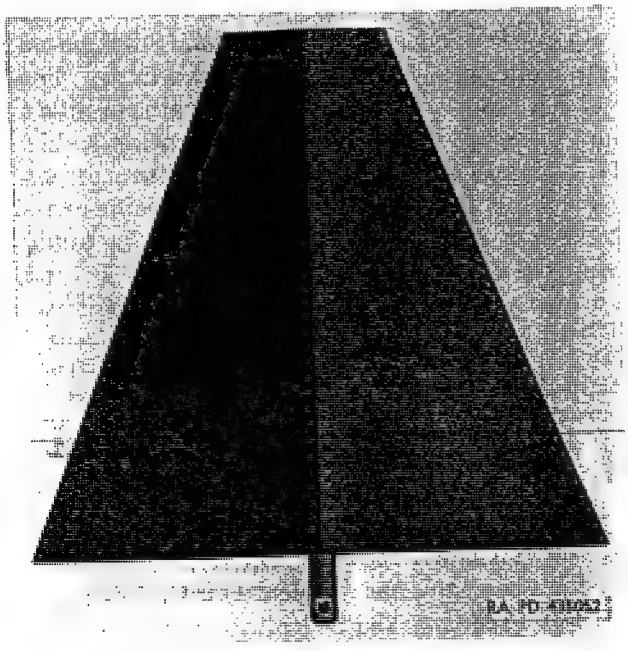

Figure 20. Guided missile jato fin M12.

magnesium, according to serial number. Fins bearing serial numbers between 1,000 and 2,000 have magnesium skin sections and a magnesium panel fitting. Those numbered 2,001 through 7,150 have aluminum skin sections with a magnesium panel fitting. Fins numbered 7,151 and higher are of all-aluminum construction. (All fins, regardless of serial number, have spars.) The jato fin has a root chord of 8 inches, has a span of 37 1/16 inches, and is inches thick at the center of the base. The fins have a circular span of 86 3/10 inc[illegible]. are painted olive-drab and weigh 21-7/2 po each.

Section III. LIQUID PROPELLANTS

29. General

Paragraphs 30 through 32 describe the fuels and oxidizer used by the missile in its powered flight after jato unit burnout and separation.

30. Guided Missile Starting Mixture Unsymmetrical Dimethylhydrazine (UDMH)

a. Use. UDMH is used as a starting fuel in the NIKE-AJAX guided missile.

b. Physical and Chemical Properties. This starting fuel is a powerful reducing agent and is hypergolic when mixed with red fuming nitric acid. UDMH is a clear, colorless, volatile liquid having a vapor pressure of 120 millimeters (approximately one-sixth of an atmosphere) at 70° F. It boils at 146° F., freezes at minus 72° F.; is soluble in all proportions with water, alcohol, and gasoline and other petroleum products, and has a sharp ammoniacal or fishy odor. This chemical is readily flammable, forming explosive compositions with air over a range of 3 to 45 volumes percent UDMH, and has a flash point of 34° F. (Tag. closed cup). The fuel is stable thermally at temperatures above the boiling point and is also detonation-stable. It is hygroscopic (will absorb moisture on exposure to humid atmosphere). The specific gravity is approximately 0.795 at 60° F. The liquid weighs 6.64 pounds per gallon at 60° F. and conforms to the following chemical composition:

UDMH	99 percent minimum
Water (H_2O)	0.3 percent maximum
Volatile impurities	2 percent maximum
Nonvolatile impurities	0.2 percent maximum

c. Toxicity and Potential Dangers.

(1) *Physiological effects.* UDMH is toxic and is a respiratory irritant and convulsant. Liquid UDMH does not appear to cause typical caustic burns or other marked irritation upon extended contact with the skin as do many other organic bases. It is not, conseque self-warning in this respect. should be taken to remove clothir which UDMH has been spi promptly and to water-flush all of exposed skin thoroughly. For ther information on first aid, see V.

(2) *Maximum allowable concentr* The strong characteristic odo UDMH allows detection of app mately 10 PPM (parts per mil vapor concentrations in atmosp The recommended MAC (maxi allowable concentration), howev 0.5 PPM for an 8-hour exposure od. Therefore, UDMH is not self-v ing in this respect.

31. Guided Missile Propellant Mixtu[illegible] M

a. Use. Guided missile propellant mi M3 is a sustainer fuel for antiaircraft g missile M1 (NIKE-AJAX). Certain hazar personnel are present as a result of the inh characteristics of this liquid.

b. Physical and Chemical Properties. G missile propellant mixture M3 is a clear, less, mobile liquid consisting of a mixtu JP–4 and unsymmetrical dimethylhydr (UDMH). It has a specific gravity of ap mately 0.782 and a boiling point of approxir 160° F. The exact boiling point may slightly depending on the variable vapor sure of JP–4. The fuel has a vapor pressu 2.3 psi at 60° F. and has a closed cup flash of minus 15° F. Due to the relatively high pressure of UDMH compared to that o JP–4, the vapor over the fuel will be, in ge similar to that of UDMH. Therefore, the will have a sharp ammoniacal odor, an liquid will be somewhat hygroscopic. Th

is reasonably toxic by absorption through the skin, inhalation, ingestion, and is very flammable. The chemical composition of the fuel by weight is as follows:

JP–4	83 ± 1 percent
UDMH	17 ± 1 percent
Water	0.4 percent maximum

c. Toxicity and Potential Dangers. Due to high vapor pressure of UDMH and its relative toxicity when compared with JP–4, the primary hazard of the fuel will be similar to that of UDMH. UDMH may be absorbed by the body through the skin, by inhalation of the fumes, and by ingestion. Vapors will irritate the upper air passages and lungs, and will cause an inflammatory reaction of the eyes. Prolonged contact may produce central nervous system stimulation resulting in convulsions and direct destruction (hemolysis of red blood cells). JP–4 is a hydrocarbon mixture and its hazards are similar to those of kerosene and gasoline. Skin contact, inhalation of vapors, and ingestion are considered hazardous.

32. Guided Missile Nitric Acid (IRFNA)

a. Use. IRFNA is used as an oxidizing agent in the NIKE-AJAX guided missile. This acid has inherent characteristics which, while necessary for its use, present hazards to personnel handling it.

b. Physical and Chemical Properties. IRFNA is a yellow to brownish-red, clear, corrosive liquid. It evolves suffocating, poisonous, yellowish-red fumes of nitrogen oxides and is a powerful oxidizing agent which promotes combustion in most organic materials. It reacts explosively with many organic liquids; e.g., unsymmetrical dimethylhydrazine, and it is miscible with water in all proportions. The nitric acid described in this manual has a specific gravity of 1.563 ± 0.007 at 20°/20° C. (68°/68° F.), a boiling point of 183° F., a freezing point of minus 68° F., and a melting point of minus 60° F. (—51° C.). Chemical composition of the acid by weight is listed in table II.

Table II. Chemical Composition of IRFNA

Component	Percent by weight
Nitric acid	81.3—84.5
Nitrogen dioxide	13.0—15.0
Water	2.0 — 2.5
Hydrofluoric acid *	0.5 — 0.7
Maximum total solids	0.1 —____

* Inhibiting agent which forms a protective coating on the inside of aluminum drums and prevents reaction between nitric acid and drums.

c. Physiological Effects. IRFNA in momentary contact with the skin will produce a yellow stain; however, more than momentary contact produces severe chemical burns. In addition to the local effects, there are toxic effects due to the fumes evolved. These fumes are formed spontaneously by the slow decomposition of the acid itself. Fumes are also produced by the decomposition of the acid in contact with organic materials and many metals, and by the interaction of the oxides of the fumes with each other and with oxygen. The most important oxides of nitrogen from the toxicity standpoint are nitric oxide, which is a colorless gas, nitrogen dioxide, a reddish-brown gas, and nitrogen tetroxide which is colorless. Both nitrogen dioxide and tetroxide are extremely toxic to the upper and lower respiratory tracts. These gases produce striking pathologic changes in the blood. For information on first aid, see table V.

d. Maximum Allowable Concentration. The maximum allowable concentration (MAC) for an 8-hour exposure period is five parts per million parts of air (ppm). Concentrations of these oxides in the order of 25 ppm are mildly irritating to eyes, nose, and throat. Concentrations from 50 to 150 ppm and above can be inhaled without significant discomfort and they are dangerous for even short exposures. Moreover, the color intensity of a dangerous concentration of these fumes may not differ remarkably from that of a safe concentration. Additional information on this subject can be found in TB MED 242.

CHAPTER 3

PACKING AND MARKING

Section I. GENERAL

33. Packing

a. Correct packing insures that components will be serviceable on arrival at missile assembly areas. Component packages are designed to protect their contents during handling, storage, and transportation. Once a component is removed from its original package, its continued serviceability may be lost through improper handling or loss of identification. Therefore, precautions must be taken to see that unpackaged components are handled carefully and repackaged as near as possible to original conditions. Dehumidified and pressurized containers should be opened only when absolutely necessary and must be properly dehumidified and pressurized when closed.

b. Metal containers, wooden crates, unpainted wooden ammunition boxes, and aluminum drums and bottles are used in packaging components. Heat-sealed envelopes with desiccant and cardboard cartons are used as intermediate or unit packs for some items.

(1) *Metal container.* The missile body is packed in a reusable metal container which is pressurized and dehumidified to protect the body from dust and moisture.

(2) *Wooden crates and boxes.* A wooden crate has been especially designed for packaging the jato unit, igniter, and thrust structure. Wooden ammunition boxes of the conventional type are used to package smaller components.

(3) *Aluminum drums.* Aluminum drums are used to package the IRFNA and the propellant mixture M3.

(4) *Aluminum bottles.* Aluminum bottles are used to package UDMH.

34. Marking

Marking includes the stenciling, stamping, and color-coding of components and their packages necessary for complete identificati also gives essential information for ha storage, stowage, loading, and issue.

a. Components containing explosives o dangerous materials will be marked in a ance with Interstate Commerce Comr Regulations if they are to be shipped b mon carrier. Special labels may be requi less-than-carload and less-than-truckloa ments. Additional labels may be requi air shipment. These components will marked in accordance with Army regu appropriate Ordnance Corps drawing Federal cataloging data. Required marki these components are given in Mil–Std–

b. Components and packages will be re and re-marked with original colors and ings unless otherwise directed. Explosi ponents obtained from salvage operati contaminated or unidentified mate clearly marked to indicate the nature item or its contaminated condition. I items are to be shipped by common carri must conform to appropriate ICC regu

c. Nomenclatures on wooden boxes stenciled in a size proportional to the dimensions of the box. A general rule of letters is 1 inch for each foot of box not to exceed 4 inches. Marking will b cordance with applicable Ordnance Corp ings.

35. Sealing

Packaged components are sealed witl ard car seals which should be intact upon of containers. Repackaged component also be sealed by this method prior to shipment.

36. Regulations Pertaining to Packing, M and Shipment

Regulations governing the packagi

marking of packaged missile components are as follows:

a. Code of Federal Regulations, Title 49, Parts 71 to 90—Transportation, 1949 Edition Revised 1950). These regulations are published in various freight tariffs listed in the appendix.

b. Bureau of Explosives, Pamphlets 6 and 6A.

c. Coast Guard Regulations, CG–108 and CG–187.

d. Military Air Transport Service, TB 59–1.

e. Civil Aeronautics Authority Regulations, Restricted Articles Tariff No. 6–A.

Section II. EXPLOSIVE COMPONENTS

37. General

a. With the exception of the jato unit M5, all explosive components are packaged in unpainted wooden ammunition boxes. These explosive components are cataloged in SM 9–5–1336. Containers and packages are listed in SM 9–1–8140.

b. Marking for boxes is shown in the following illustrations:

(1) Safety and Arming Device M30A1*, figure 21.

(2) Safety and Arming Device M27, figure 22.

(3) Explosive Harness Assembly M24 or M45, figure 23.

(4) Warhead M2, figure 24.

(5) Warhead M3, figure 25.

(6) Warhead M4, figure 26.

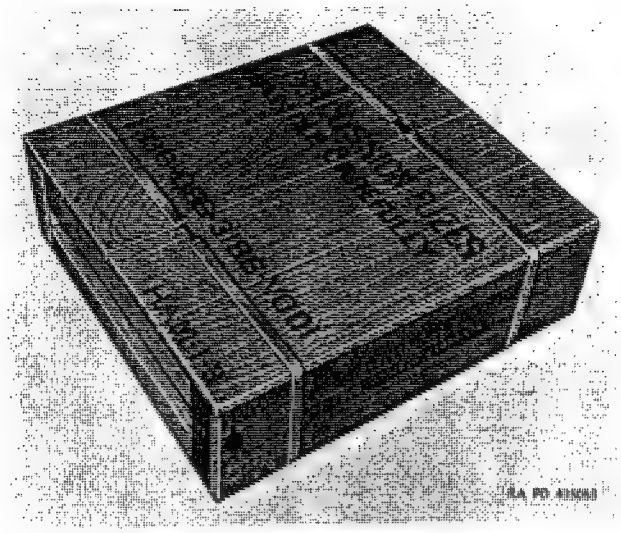

Figure 22. Packing-box for safety and arming device M27.

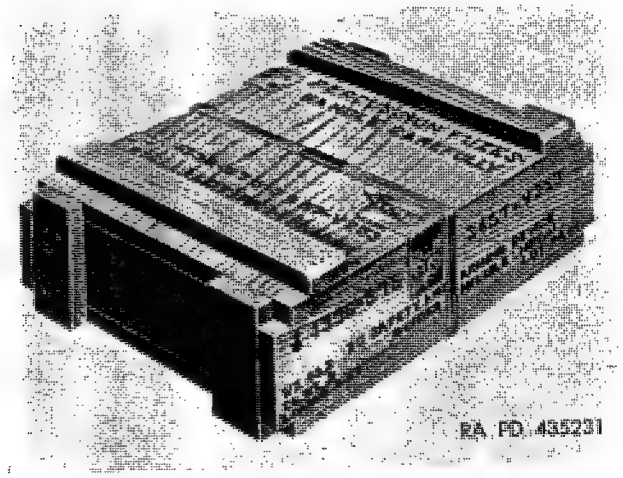

Figure 21. Packing-box for safety and arming device M30A1.

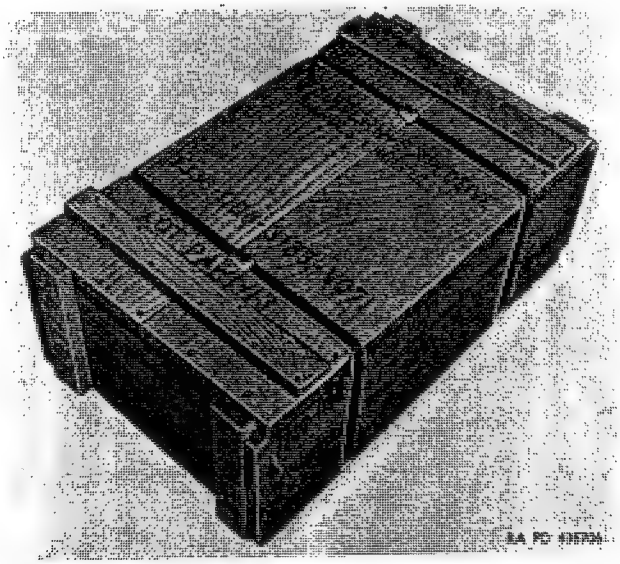

Figure 23. Packing-box for explosive harness assembly M24.

* The M30A1 and M30 safety and arming mechanisms are packaged in similar containers.

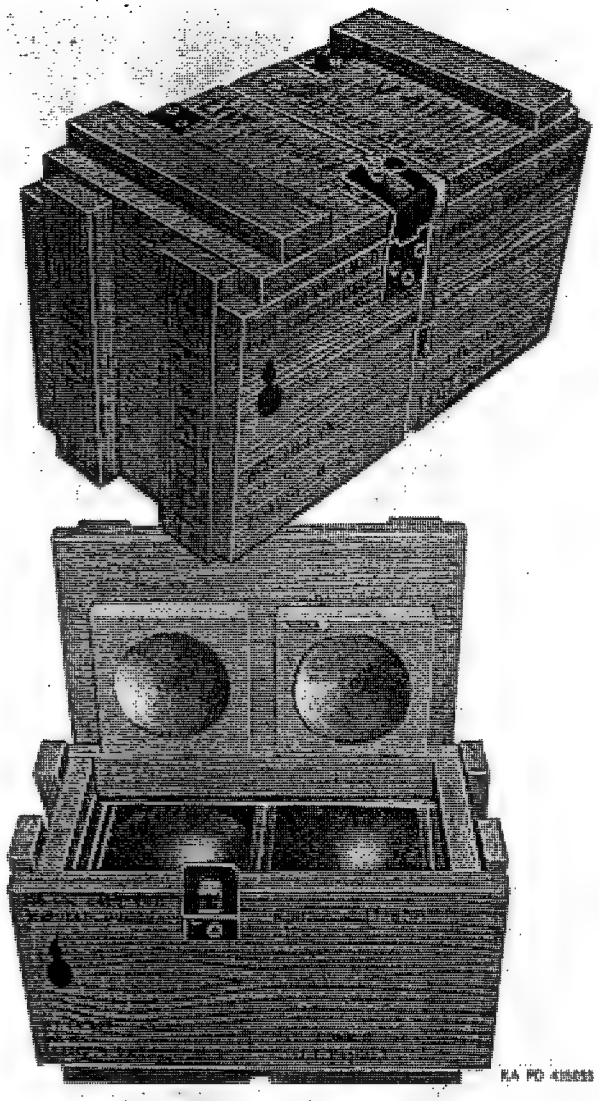

Figure 24. Packing-box for warhead M2.

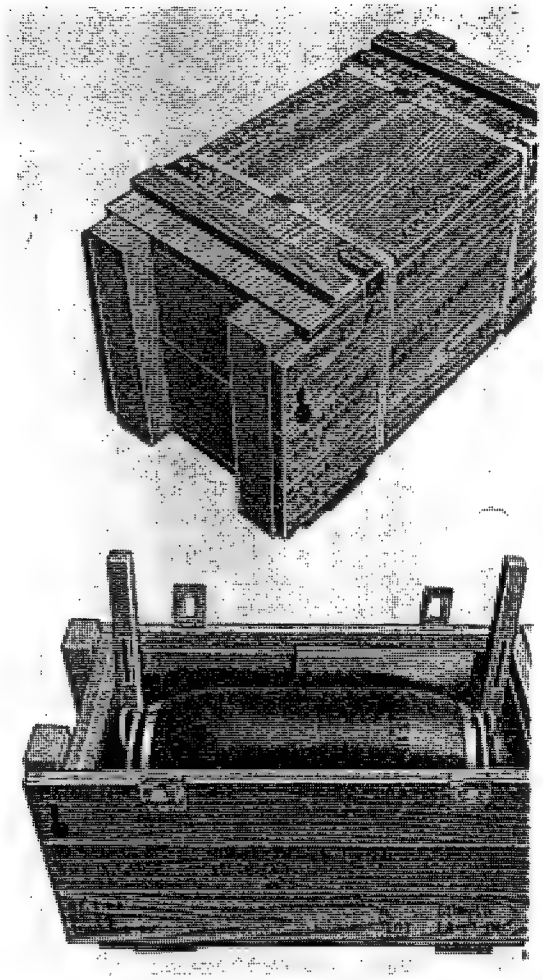

Figure 25. Packing-box for warhead M3

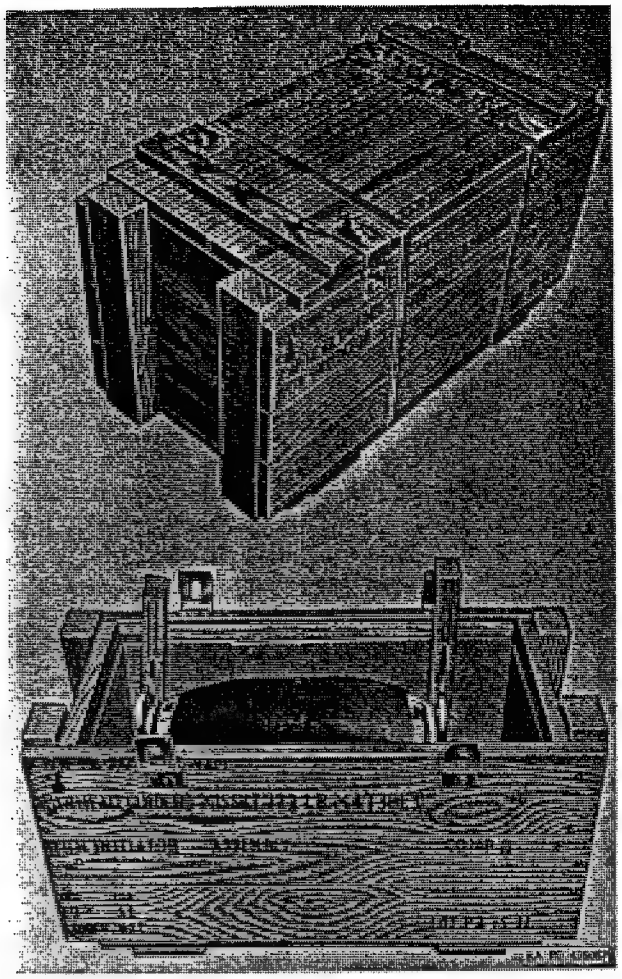

Figure 26. Packing-box for warhead M4.

33. Jato Unit M5

a. General. This component is packaged in the wooden crate M13. Logistical information on this unit can be found in SM 9–5–1336.

b. Wooden Crate M13 (fig. 27). This container is a sheathed crate. It consists of a base to which the jato unit is strapped and a cover provided with two lifting eyes. The cover attaches to the base by 22 lag bolts. A plywood compartment in the aft end of the crate houses the separately packaged igniter. This compartment is accessible from the outside by means of a hinged door. The jato unit may be shipped in this crate with or without the thrust structure assembled. The crate is painted olive-drab and marked in black as shown in figure 27.

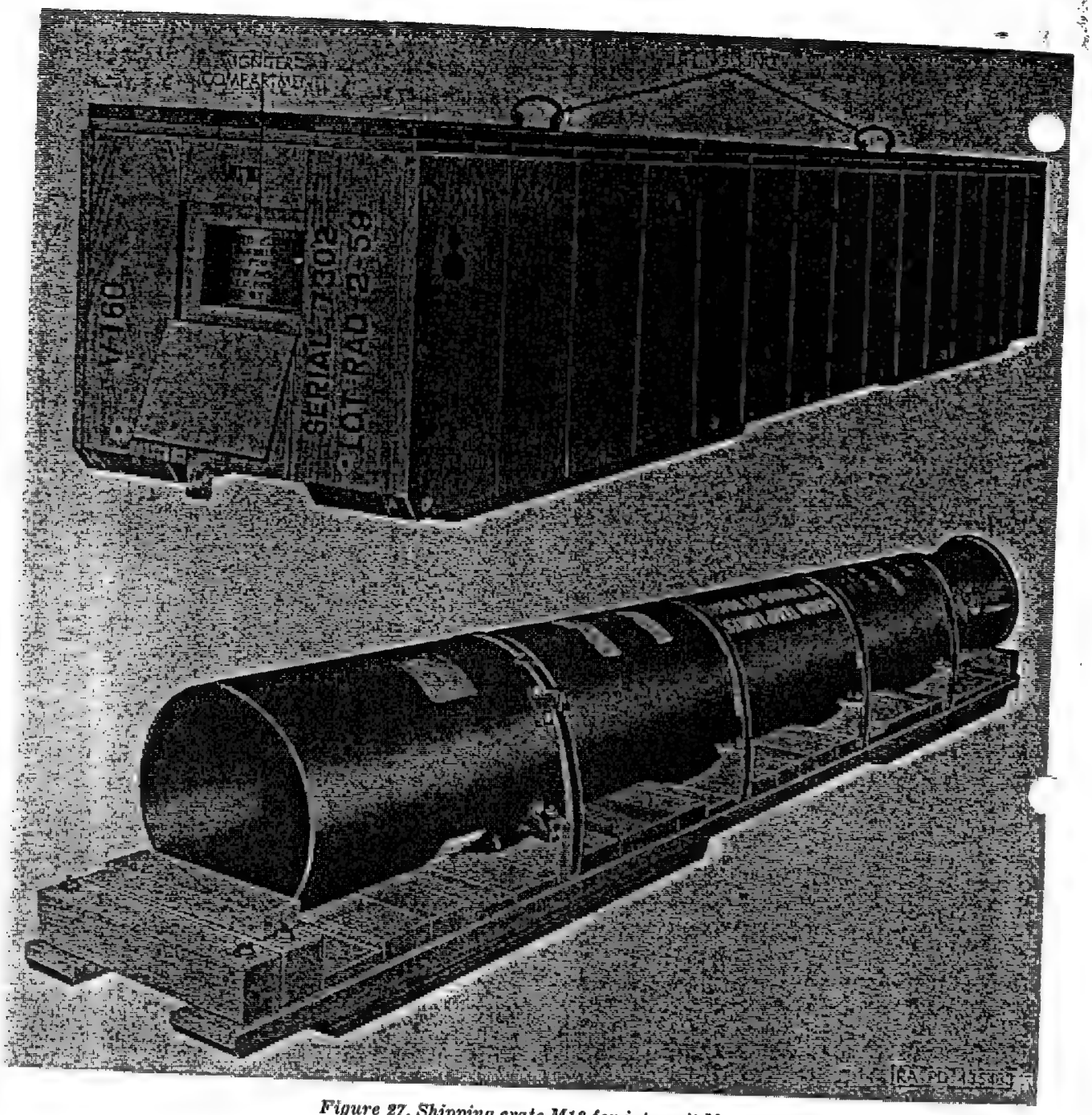

Figure 27. Shipping crate M13 for jato unit M5.

Section III. NONEXPLOSIVE COMPONENTS

39. General

a. With the exception of the missile body, nonexplosive components are packaged in unpainted wooden ammunition boxes. These components, including the missile body, are cataloged in FSC Group 14.

b. Marking for these component boxes is shown in the following illustrations:

(1) Storage battery BB–401/U, figure 28.

(2) Stabilizer fin M9 and control fin M10, figure 29.

(3) Delay lines, GS 17194 series, figure 30.

Figure 28. Packing-box for storage battery BB–401/U.

(4) Thrust structure M2, figure 31.

(5) Jato fin M12, figure 32.

40. Guided Missile Body M2 and XM2

a. Missile Shipping Container M326 (fig. 33). This pressurized and dehumidified container is designed to protect the missile body from deterioration and damage caused by adverse conditions of weather, storage, handling, and transportation. Removable end-covers bolt to the container body, and gaskets between the end-covers and container body maintain the hermetic seal. To protect the missile body from dampness, the container is pressurized to 5 psig with dry air. Silica gel desiccants and humidity indicator cards provide further protection and checks against dampness. To cushion the missile body against vibration and shock during transportation and handling, the container has a carriage assembly secured to the container body by eight rubber shock mounts and four automobile-type shock absorbers. The carriage assembly consists of a fixed-rail container frame assembly and a movable-rail missile frame assembly. Two handling ring assemblies bolted to the body secure the missile body within the upper and lower troughs of the movable-rail frame. For further information on handling rings, see *b* below. Two metal pry bars provided with each container are used to lift the movable-rail frame onto the fixed rails of the container frame assembly. The missile body is always removed and replaced in the container through the *aft* end, though it may be

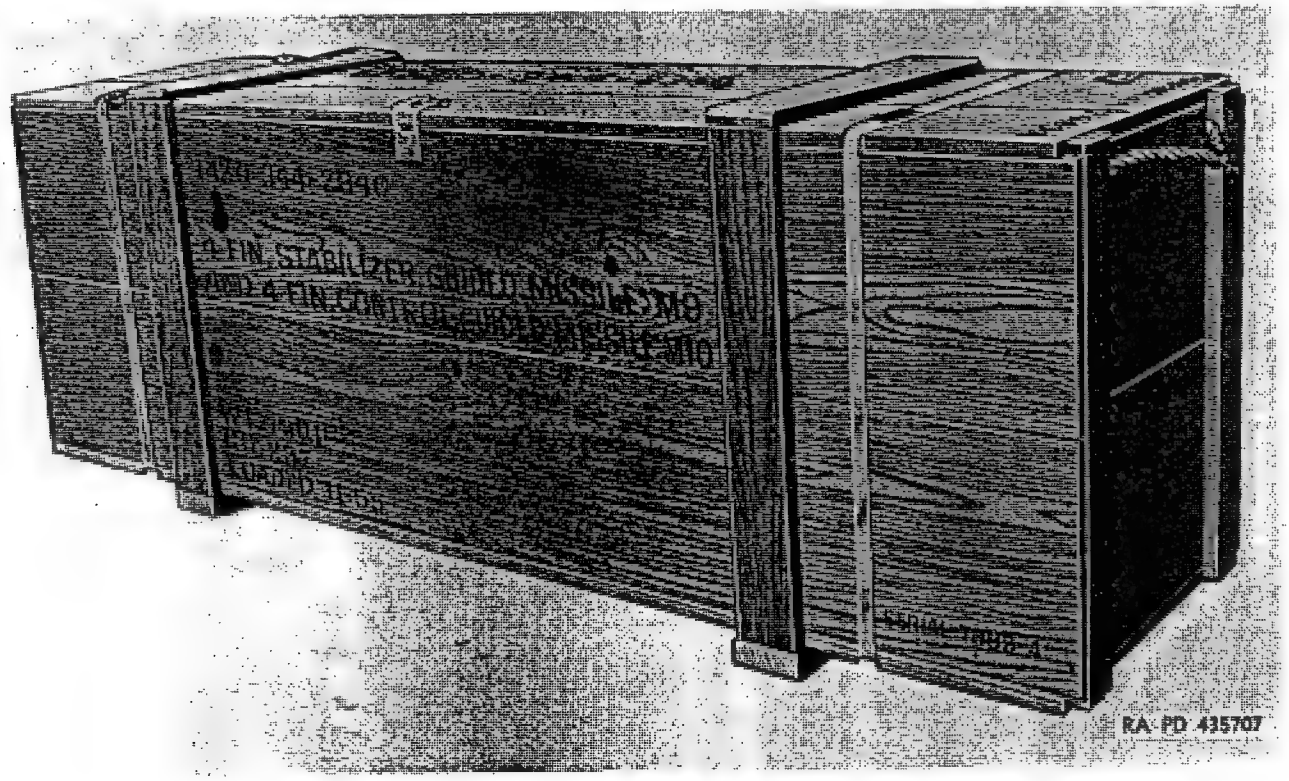

Figure 29. Packing-box for stabilizer fin M9 and control fin 10.

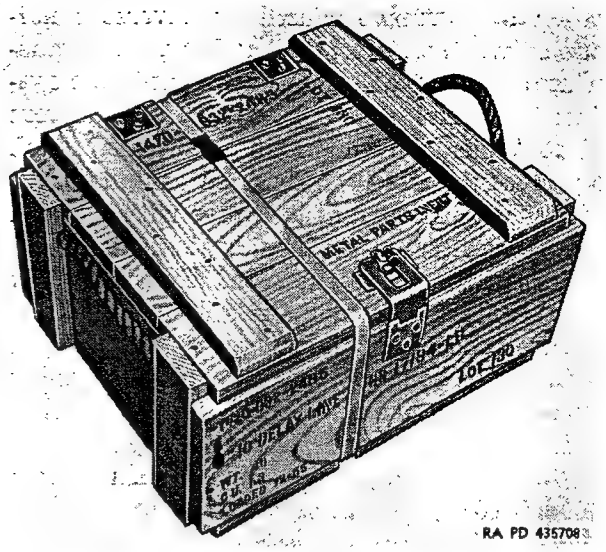

Figure 30. Packing-box for delay lines, GS 17194 series.

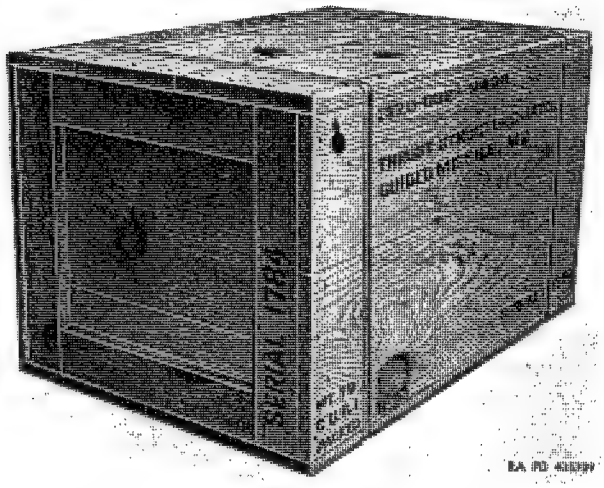

Figure 31. Packing-box for thrust structure M2.

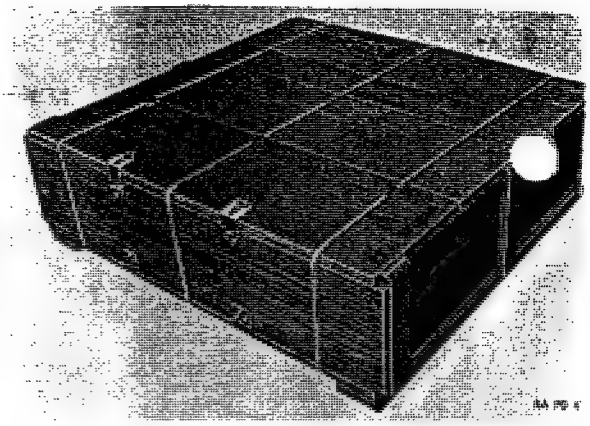

Figure 32. Packing-box for jato fin M12.

pulled out the forward end far enough for insp tion and certain minor maintenance. Each e cover of the container has a gang recepta housing that contains an air-filling valve, a re valve, and a window through which a humic indicator card is visible. Both end-covers h wire baskets attached to the inside for hold desiccant bags. A logbook receptacle in the ward cover provides a shipping compartment unclassified portions of missile logbooks. lifting eyes on top of the container allow it t raised by conventional handling equipm Eight wooden skids are attached to the contai The container is painted white with black ma ings as shown in figure 33. Informatio n container can be found in SM 9–1–814..

b. Handling Ring Assembly for Conta M326. The missile body is shipped in this tainer with two complete handling ring as blies consisting of four segments each. T

Vair Cg,

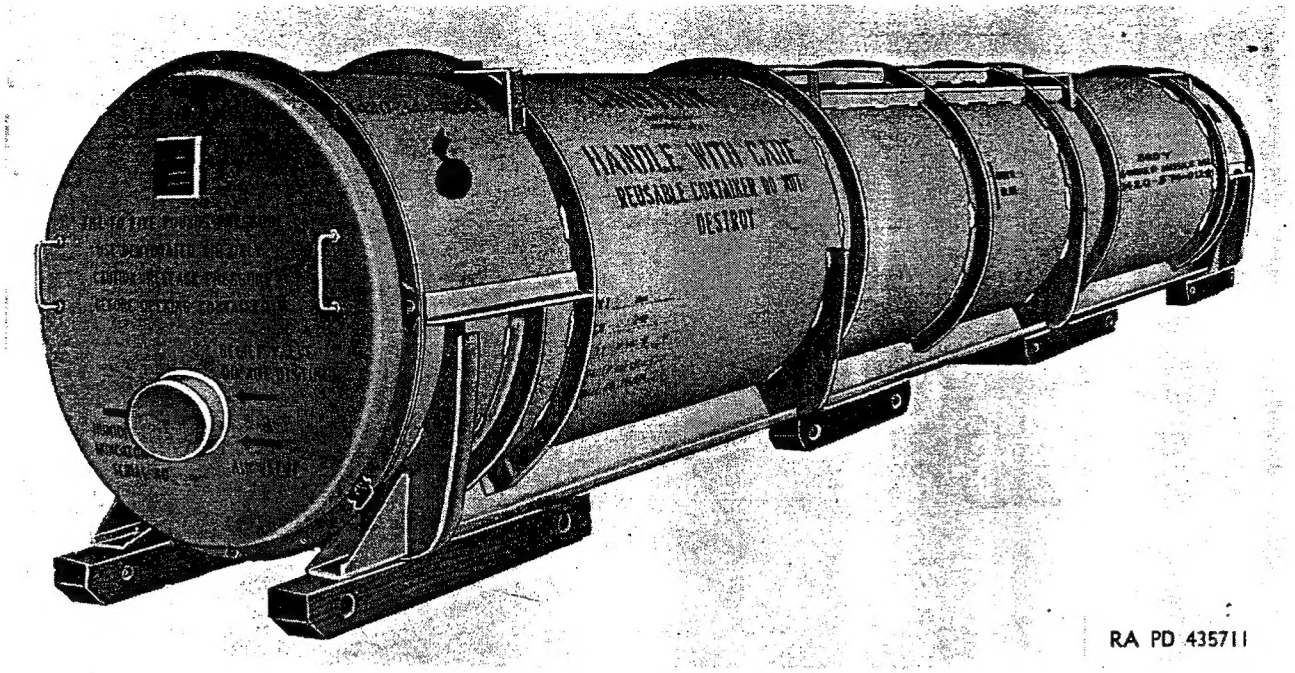

Figure 33. Container M326 for missile body M2 and XM2.

ring assemblies are identical (fig. 34). Each of the segments has *two* Ordnance part numbers stamped on it: four are marked 8020255 and 3020230, and four are marked 8020229 and 8020231. The segments marked 8020255 and 8020230 are attached to the missile body between tunnels 1 and 4 and tunnels 2 and 3. Those marked 8020229 and 8020231 are attached between tunnels 1 and 2 and tunnels 3 and 4.

c. Unpacking Body From Container M326. The procedure for removing the body from M326 container is outlined in TM 5001–19.

d. Preparing Container for Repacking. Before the missile body is repacked in the container, the container must be free of dirt, oil, and grease. A garden hose with a low-pressure water supply and a brush can be used to remove dirt; oil and grease can be removed with a neutral clear petroleum distillate (Soddard solvent, Federal Specification P–S–661). After removing dirt, oil, and grease the interior of the container must be thoroughly dried by using compressed air, rags, waste, or chamois. The shock mounts and shock absorbers should be checked for proper operation and functioning. The desiccant bags in the wire baskets at both ends of the container must be replaced with fresh bags (MIL–D–3464), and the humidity indicator cards in the receptacle plates of both end covers must be replaced. Before the sealing gasket is replaced on the end-cover, it should be inspected for serviceability and lubricated with a light coat of DC–4 grease. Finally, the end-cover bolts should be checked to see that they are free from rust or grit.

e. Packing Body in Container M326. The body can be packed in the container by reversing the unpacking procedures outlined in FM 44–80 and TM 9–5001–19.

Note. When missile bodies or other components which are serially numbered are repackaged in reusable containers for further shipment or storage, these containers must be re-marked to show the correct serial number. Serial numbers from previous shipments must be obliterated.

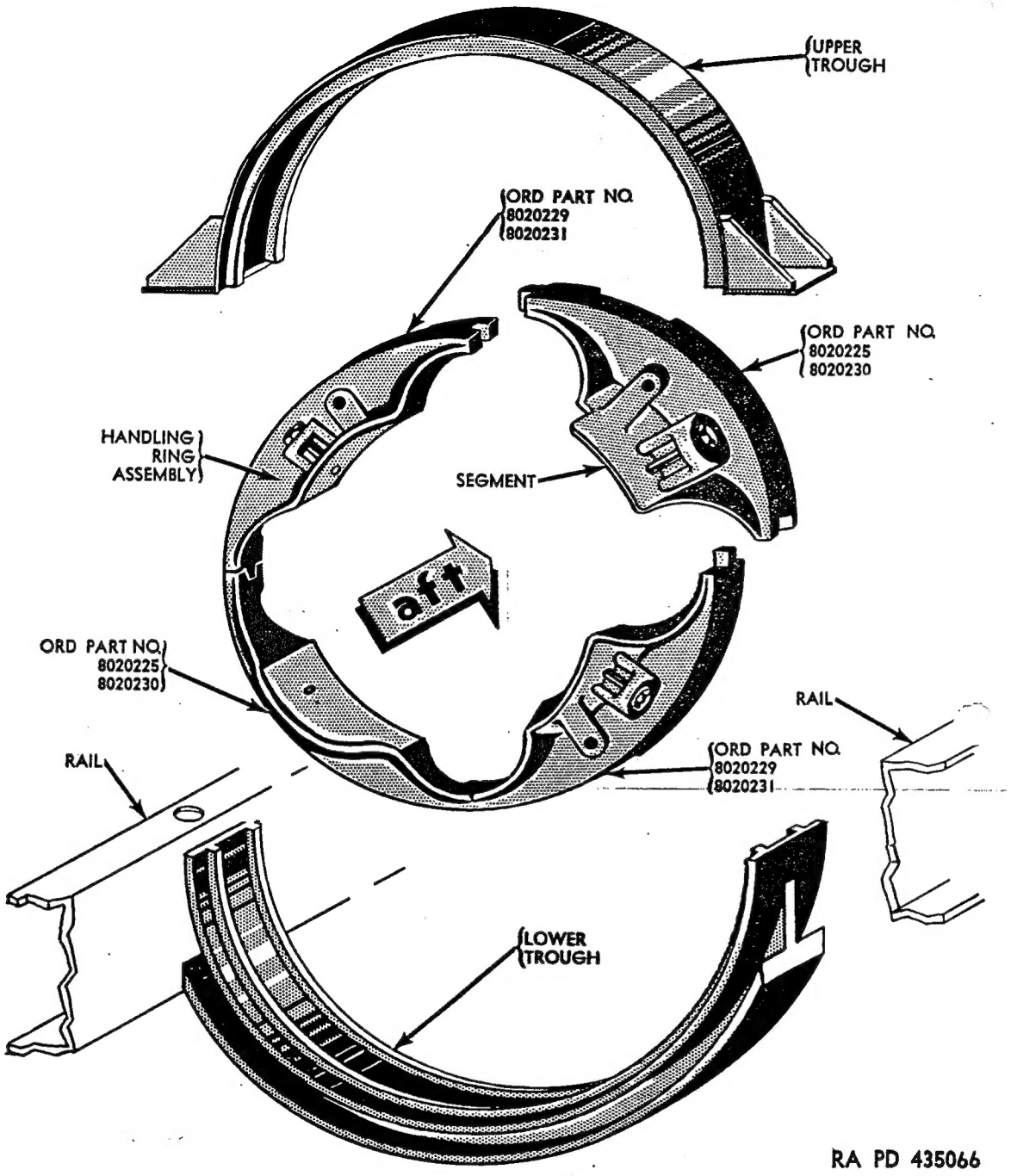

Figure 34. Handling ring assembly for shipping container M326.

41. Starting Mixture Container (fig. 35)

UDMH starting mixture is packaged in aluminum bottles (1.07 pounds per bottle), which are encased in a heat sealed envelope. Four enveloped bottles are overpacked in a wooden ammunition box. Included in each ammunition box is a gravity-filling apparatus with filling instructions attached to the inside of the box lid. The boxes are marked as shown in figure 35.

42. IRFNA and Propellant Mixture M3 (fig. 36)

IRFNA is packaged in a specially designed aluminum (99 percent pure) drum. This drum is marked as shown in figure 36. Propellant mixture M3 is also packaged in a specially designed alumnium drum. This drum is marked as shown in figure 37.

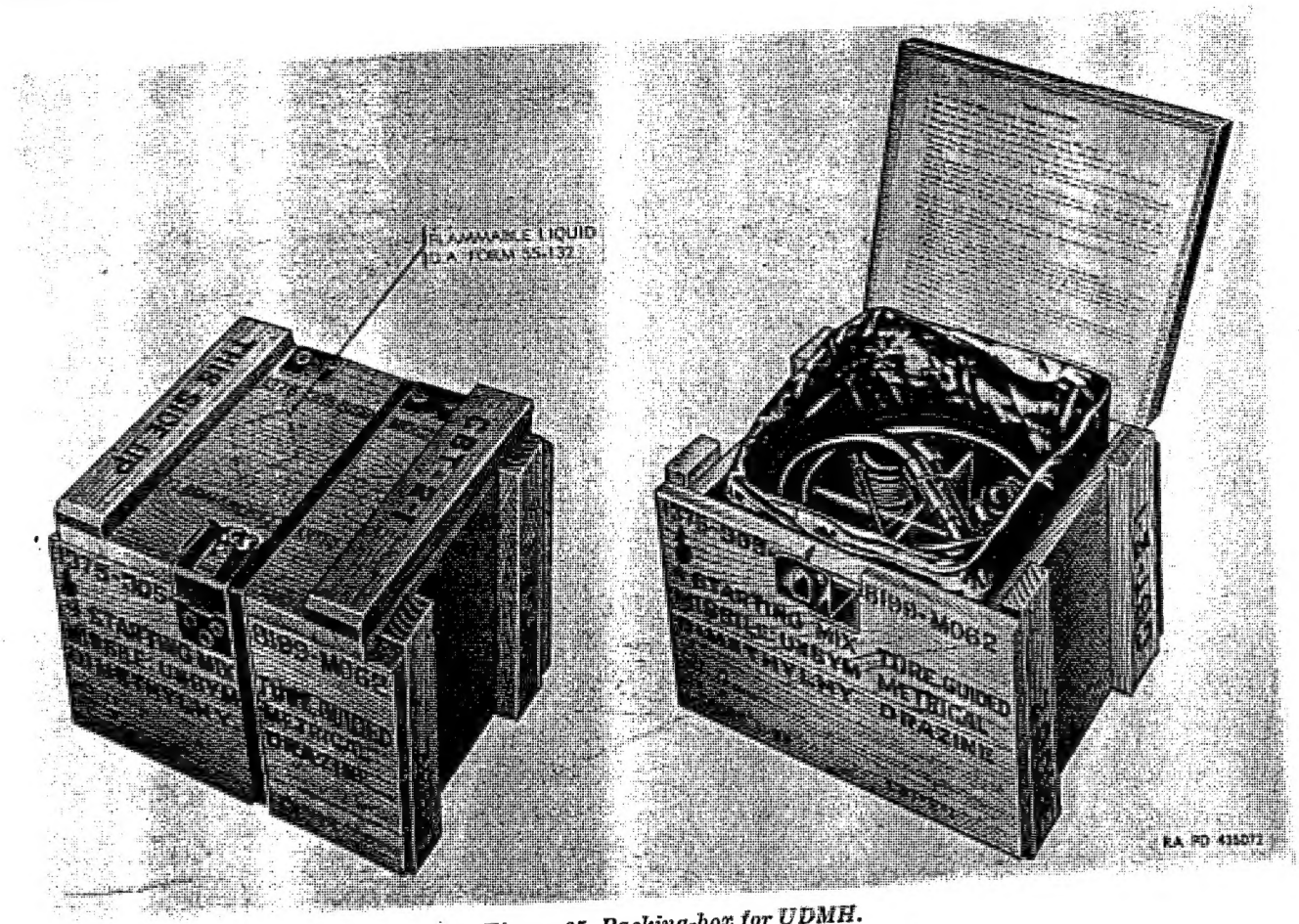

Figure 35. Packing-box for UDMH.

Figure 36. Drum for IRFNA.

Figure 37. Drum for guided missile, prop mixture M3.